



U.E.T Lahore
Faisalabad Campus

UET BSH MAGAZINE (2023)



Department of Basic Sciences & Humanities



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Vice Chancellor's message

Science occupies the "discovery space." The scientist's goal is to get a deeper understanding of the natural world. Engineering occupies the "design space." The engineer's goal is to take that understanding of the natural world, and apply it to something useful. Science and engineering are both important to develop technology in the society. I am thrilled to announce the launch of your new magazine.



Prof. Dr. Syed Mansoor Sarwar
Vice-Chancellor UET Lahore

This publication is a nice effort by this department to showcase their research, ideas and contributions to the field of basic sciences and humanities. This magazine will provide a valuable resource for members of the department, as well as for the wider academic community, to stay informed about the latest developments and trends in the field. The diverse content of the magazine will reflect the rich intellectual climate of the department and the wide range of disciplines it encompasses. I am confident that this magazine will become an important tool for promoting the department and its achievements both within and outside the university. It would certainly foster and inspire faculty and students both to think critically and write effectively by utilizing this platform. . I wish the best to magazine team, faculty and the students of the department to make this magazine a success. I encourage everyone to actively contribute to the magazine and help spread the word about its launch.

Congratulations on this exciting new initiative, and I look forward to reading the first issue.

Dean's message

Dear readers,

It gives me great pleasure to welcome you to the first edition of our magazine of Basic Sciences and Humanities. I am proud to showcase the incredible work and achievements of our students, faculty and researchers in the field of Science, Social Science and Humanities.

In this edition you will find a diverse range of articles, covering topics from the latest scientific breakthroughs to insightful analysis of social issues and cultural trends. Our contributors have worked tirelessly to bring you engaging and thought provoking content that reflects the breadth and depth of our academic community. At our faculty, we believe that a strong foundation in the basic sciences and humanities is crucial for developing the skills and knowledge necessary to navigate an ever-changing world. We are committed to providing our students with rigorous education that prepares them for success in their chosen fields, while also fostering their intellectual curiosity and critical thinking abilities.

I hope that you will enjoy reading this edition of our magazine and that it will inspire you to delve deeper into the fascinating world of Basic Sciences and Humanities.

Sincerely,

Dean
Faculty of Natural Sciences, Humanities & Islamic Studies



Prof. Dr. M. Shaihd Rafique
Dean, Faculty of Natural
Sciences, Humanities & Islamic
Studies, UET, Lahore

Chairperson's message

Dear readers,

I extend my warmest welcome to you as we proudly present the inaugural edition of the Basic Sciences and Humanities (BSH) magazine. It is with great enthusiasm that we introduce you to the diverse and captivating world of our department.

As the Chairman of the Department of Basic Sciences and Humanities, I am delighted to showcase the exceptional work, accomplishments, and insights of our esteemed faculty, dedicated students and researchers. This magazine serves as a platform to celebrate the remarkable contributions and advancements in the fields of Science, Social Science, and Humanities. Within the pages of this edition, you will not only discover a rich assortment of articles that delve into the latest scientific breakthroughs, thought-provoking analysis of social issues, and captivating explorations of cultural trends but also an insightful introduction to our esteemed faculty, their profiles, and their invaluable contributions to the academic community.

Thank you for joining us on this exciting journey. Your support and engagement are invaluable as we continue to strive for excellence and contribute to the ever-evolving landscape of academia.

Warm regards,
Chairman,
Department of Basic Sciences and Humanities



Prof. Dr. Sajjad Ahmad
Chairperson Department of
Basic Sciences & Humanities
UET Lahore FSD Campus

Prof. Dr. Sajjad Ahmad

PROFESSOR, CHEMISTRY

Sajjad Ahmad, born in 1982 and raised in the small town of Jhang, Pakistan, embarked on a remarkable journey of academic and professional accomplishments. At the age of 18, he ventured to Lahore, where he gained admission to the prestigious Government College University (GCU). Sajjad completed his B.Sc. Hons degree in Chemistry with distinction, leaving an indelible mark on his academic journey. He continued his pursuit of knowledge and earned an M.S. in Chemistry in 2004, earning the esteemed Roll of Honor and a GOLD Medal from GCU Lahore.

Driven by his passion for learning, Sajjad pursued an M.Phil. in Applied Chemistry from UET Lahore and obtained a Professional Diploma in Quality Management as a Postgraduate Diploma (PGD) from PIQC/NUST. He began his professional career at The Medical Lab Pvt. Limited, where he pioneered innovative approaches for Good Laboratory Practices (GLP) and served as an internal auditor under ISO regulations.

His expertise and enthusiasm for new developments led him to work as an R&D Chemist at the Descon chemical manufacturing plant, where he played a pivotal role in the development of various industrial chemicals, including water-reducible alkyds, polyesters, adhesives, and epoxide oils.

In 2008, Sajjad was awarded a scholarship by UET Lahore for higher studies, which led him to



join the research group of Dr. Andrew Sutherland at the University of Glasgow, UK, as a PhD student. In 2012, he successfully defended his doctoral thesis, earning his PhD from the University of Glasgow.

Following his academic pursuits, Sajjad returned to UET Lahore as an Assistant Professor of Chemistry. In 2012, he also served on deputation at MNS UET Multan and assumed the role of Acting Campus Coordinator until 2015. Demonstrating exceptional dedication and leadership, he was appointed as an Associate Professor of Chemistry in 2018 and took on the responsibilities of Chairman of the Department of Basic Sciences and Humanities at UET Lahore Faisalabad Campus.

During his tenure as Chairman, Sajjad spearheaded numerous development projects within the department, including the construction of new offices, laboratories, and grassy grounds. Under his guidance, the department received approval from the Higher Education Commission (HEC) of Pakistan to launch the M.Phil. pro-

gram in Applied Chemistry. In line with the vision of the Vice Chancellor, additional programs such as BS Environmental Sciences, BS Chemistry, and forthcoming programs such as BS Mathematics, BBA, and PhD in Chemistry were initiated.

While shouldering departmental duties and teaching responsibilities, Sajjad's research endeavors in organic synthesis and analytical estimations continued unabated. His dedication and focus led to the successful acquisition of two competitive research grants: a 3.5 million grant from HEC under the NRPU scheme for developing a one-pot tandem process to synthesize anticancer compounds, and a 4.0 million grant from PHEC under the Punjab Innovation Research Challenge Award for the synthesis of biocides for the leather and paint industries at an industrial scale.

Presently, Dr. Sajjad Ahmad holds the esteemed position of Professor of Chemistry and Chairman of the BSH department at UET Lahore Faisalabad Campus. He leads a dynamic research group focused on developing novel synthetic methodologies for chiral, biologically active, and medically important compounds, as well as compounds of industrial significance.

Beyond his professional commitments, Sajjad actively contributes to the campus sports committee as the convener, supporting sports activities on the campus. In his leisure time, he indulges in running, hill climbing, and playing squash. Additionally, he is a member of the rotary club and the World

Wide Fund for Nature (WWF). Sajjad's diverse interests also extend to reading books and exploring the countryside through travel.



DR. GHUFRANA SAMIN
(ASSOCIATE PROFESSOR, CHEMISTRY)

Dr Ghufrana Samin is an Associate Professor of Chemistry at University of Engineering and Technology Lahore Faisalabad Campus. She got her master degree in Chemistry from University of Agriculture Faisalabad with distinction and was awarded gold medal. She received her Ph.D. in Chemistry from University of Groningen, The Netherlands in 2012 under the supervision of the Professor Dick Janssen. On her Ph. D work, she was appointed as an Assistant Professor in 2013. Later, she was promoted to Associate Professor in 2022. She has evaluated many M. Phil and Ph. D. thesis. She has more than 30 research papers with more than 60 impact factor having 450 citations. During her career, she got best presenter prizes many times. Her research interests are biodegradation, genetic Engineering and Nano-catalysis. She is an active reviewer of many journals as well.



DR. FAISAL NAWAZ
(ASSOCIATE PROFESSOR, CHEMISTRY)

Dr. Faisal Nawaz did MSc Chemistry from institute of Chemistry, University of the Punjab in 2005. Then he worked As Quality Control Analyst in Renowned National Pharmaceutical companies for 3 years. In 2008 he won MOE Pakistan and Chinese Scholarship council's "Cultural exchange Program". After Earning PhD he served in University Of Gujrat As Assistant professor from 2013-2015. In July 2015 Dr. Faisal joined UET Lahore FSD Campus as Assistant Professor. Since April 2021 he is working as Tenured Associate Professor. His areas of research interest are Nano chemistry especially in carbon nanostructures, photo catalysis and composite materials. Dr. Faisal Nawaz has won research grants from HEC Pakistan both as principal investigator as well as co-principal Investigator. He has supervised more than 15 MPhil research students in UET. Besides, He is in charge Financial Aid & career services in Faisalabad campus as well as focal person of Bachelors in Environmental Sciences program for Faisalabad campus.



DR. ABDUR REHMAN
(ASSISTANT PROFESSOR, MATHEMATICS)

Dr. Abdur Rehman, completed his M.Sc. in Mathematics in September 2004. He worked as a Lecturer in Army Public Degree College Sargodha Cantt for one year. He joined UET FSD campus as a Lecturer in December 2005 making him one of the pioneers at UET FSD campus. He has taught various subject of Mathematics to the undergraduate students of different engineering departments. In 2012, he got an international scholarship from CSC for Ph.D. and completed his doctoral degree through this scholarship in 2015. Currently, he works as Assistant Professor in the department of Basic Sciences and Humanities (Mathematics). His research interest includes the area of Linear Algebra. He is also author of also one book chapter in "Hot Topic in Linear Algebra" published in USA. He has 18 SCI publications with more than 165 citations. He has taught several subjects of mathematics which include Linear Algebra, Numerical Analysis, Differential Equations, Calculus and Multivariate Calculus.



DR. ARSHI KHALID
(ASSOCIATE PROFESSOR, MATHEMATICS)

Dr. Arshi Khalid has been working in the department of Basic Sciences and Humanities, University of Engineering and Technology Lahore, Faisalabad Campus since May 2007. She completed her PhD studies from Korea Advance Institute of Science & Technology (KAIST) South Korea. Her research is on Inverse Problems Biomedical Imaging in which she did a comprehensive study of source localization with efficient spatial and temporal resolution techniques such as MUSIC, FOCUSS and minimum norm to dig down brain activity in pathological brain. She has published her research in the prestigious journal of neuroImage as a lead author. Moreover, she has more than 15 publications with 500+ citations. She received her M.Phil. degree in Applied Mathematics from the University of Engineering and Technology Lahore, Pakistan. In which her research was focused on temperature heat profile in Transformers fin using numerical techniques.



DR. ILYAS AHMAD
(ASSOCIATE PROFESSOR, MATHEMATICS)

Dr. Ilyas Ali did his MSc degree in 2006 from The Islamia University Bahawalpur in Pure Mathematics. In September 2010, He got Chinese Government Scholarship for PhD degree in Mathematics. He received his PhD degree in June 2014. After completing PhD, he worked as Assistant Professor from August 2014 to July 2015 at Department of Mathematics, COM-SATS Institute of Information Technology, Sahiwal. He Joined University of Engineering and Technology Lahore, Faisalabad Campus in 2015 as Assistant Professor Mathematics. From December 2022, he is working as Associate Professor Mathematics. His main research interest is Operators and Matrices Inequalities, Generalized Inverse Theory for Matrices and Integral Inequalities. He has published 21 research articles in well reputed international peer-reviewed journals including fourteen articles in impact factor journals. He has supervised one PhD and one MPhil student up to now. He is convener of Anti-Dengue committee of Faisalabad campus and department guest lectures and training committee.

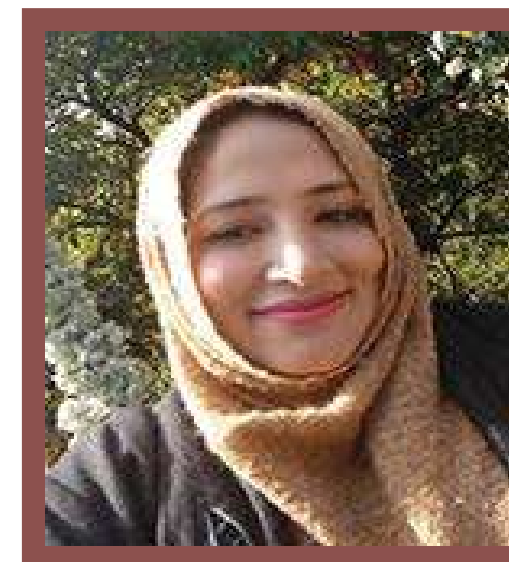


DR. SHAZIA KARIM
(ASSISTANT PROFESSOR, MATHEMATICS)

Dr. Shazia Karim is a seasoned academician. She born in Faisalabad. Presently she is working as Assistant Professor of Mathematics at UET FSD Campus. She got her PhD degree from UET Lahore and MSC Statistics degree from UAF. She is one of the pioneer teachers with an experience of 17 years. She is serving this esteemed institute since December 2005. Along with teaching multiple mathematics and Statistics courses, she also served at different administrative positions at campus like Resident Tutor and Incharge semester cell. As a teacher of Mathematics she selects the teaching strategy most suited to the current level of knowledge of the students. As a researcher, she has published her research articles in different international journals with high impact factors and citations. Her research work focuses on Operator and Matrices inequalities, Numerical Analysis and Fractional Calculus.

DR. NOSHEEN SHAHZADI
(LECTURER, PHYSICS)

Dr. Nosheen Shahzadi has been working as lecturer in the department of basic sciences and humanities, University of Engineering and Technology Lahore, Faisalabad Campus since January 2013. She completed her PhD studies from Hanyang University South Korea. Her research is on device Physics in which she has a comprehensive study of individual trap's dynamics in CMOS devices while using TCAD simulations. She has published her research in the prestigious journal of IEEE Transactions on Electron Devices as a lead author. She received her M.Phil. degree in physics from the University of Engineering and Technology Lahore, Pakistan, and B.S. degree in physics from G.C University, Faisalabad, Pakistan, in 2012 and 2010, respectively. In which her research was focused on Laser induced breakdown spectroscopy (LIBS) and Pulsed laser deposition (PLD). After her M.Phil. study she served the Physics department in G. C. University Faisalabad as the lecturer Physics. As a subject, Physics act more like a mother science that expands to many other fields of science and technology. Consequently, being a Physicist she has the skills to keep calm and try her best to leave no student behind. Physics plays a vital role in understanding the world around us and satisfying our curiosity that helps to develop our critical thinking and problem-solving skills. In



the era of device Physics, Physicists works to design and construct devices that can control electrons and photons for use in sensing and detection, information processing and studying the fundamental properties of matter.

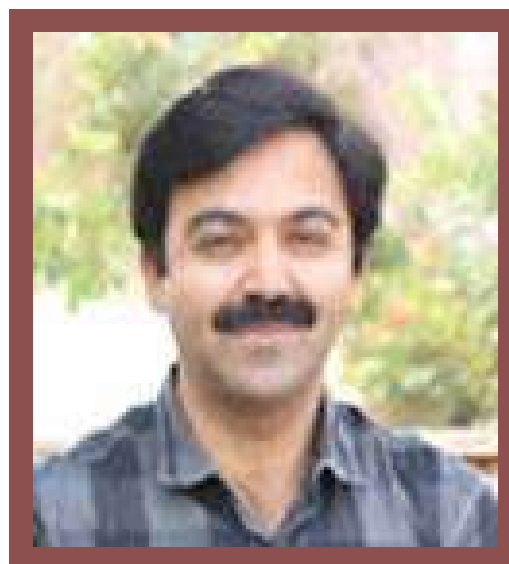
DR. MUHAMMAD YASIR

(ASSISTANT PROFESSOR, COMPUTER SCIENCE)

Dr. Muhammad Yasir is working as Assistant Professor of Computer Science in UET Faisalabad Campus, having experience of almost 14 years. He is teaching numerous computing courses, such as data science, computer programming, data structures, algorithms, and computer networks in various departments at UET. Besides teaching, he is an enthusiastic researcher, doing research in network science, complex systems, data science, agent-based modeling and simulation, IoT, and big data analytics. His research has been published in top tier international journals. Currently, he is running the following three interdisciplinary research groups at UET Faisalabad.

- Complex Systems and Data Science (CSDS)
- Applied Intelligence and Machine Learning (AIML)
- Cyber Security and Cryptography (CSC)

Currently, Dr. Yasir is applying the tools of network science and graph theory to study the dynamics of complex systems, such as human brain (study of brain disorders and psychology), markets, and economy. Moreover, along with his team of researchers including psychologists, economists, and social scientists, he has done some outstanding research pertinent to the



society of Pakistan. Some remarkable works done by his team include:

- Identifying the co-occurring diseases faced by informal working class of Pakistan with the help of data science.
- Identifying key factors paving the way for Intimate Partner Violence with the help of data science.

Dr. Yasir is holding the following administrative positions at UET Faisalabad.

- Head of the technical team responsible for conducting UET admission test.
- Focal person of Computer Science program for HEC.

**MR. Mohsin Sheraz**

(LECTURER, COMPUTER SCIENCE)

Mr. Mohsin Sheraz is serving as Lecturer in the Department of Basic Sciences and Humanities FSD, Campus at University of Engineering & Technology (UET) Lahore. He did his BS. in Computer Science from University of the Punjab and MS in Information Technology from NUST School of Electrical Engineering and Computer Science (NUST-SEECS). Presently, he is doing his Ph.D. in Computer Science from University of Engineering & Technology Lahore. His research interests include Machine learning and Deep learning.

**DR. ASLAM SIDDIQUE**

(ASSISTANT PROFESSOR, ISLAMIC STUDIES)

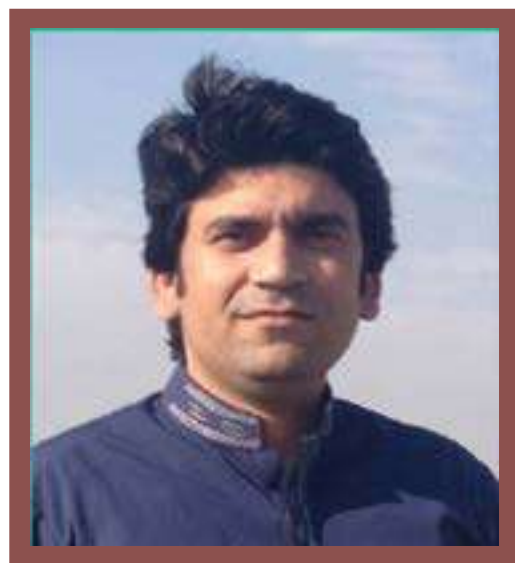
Dr. Muhammad Aslam Siddique is a passionate teacher with more than 15 years of experience developing and implementing diverse curriculums such as Islamic Studies, Arabic and Quran. Focused at motivating students through positive encouragement and reinforcement of concepts via interactive classroom instruction and observation. Successful in helping students develop basic teachings of Islam in the light of Qur'an and Sunnah and strong ethical and moral leaning skill and behaviour.

Currently Dr. Muhammad Aslam Siddique is serving as Assistant Professor in Department of Basic sciences & Humanities, UET Lahore, Faisalabad Campus. He received his PhD degree from University of the Punjab Lahore. His research was primarily focused on the Quranic Sciences Qiraat and Orientalism.

Mr. Kamran Shaheen

ASSISTANT PROFESSOR, ENGLISH

Mr. Kamran Shaheen is resourceful English teacher with a M.S Applied Linguistics degree. Focused on student learning and engagement he is committed to delivering exceptional learning experiences by challenging students with rigorous coursework and engages them with exposure to interactive classroom environment. As a keen facilitator he keeps students on task with proactive behavior modification and positive reinforcement strategies. Constructed, organized, and provided lesson plans that embark students with the English Language Proficiency Standards (ELPS). Patient and energetic with all students, Mr. Kamran is dedicated to creating an enjoyable, inviting and dynamic learning atmosphere which leads to positive results. As a collaborative professional, he enjoyed teaching various English courses i.e. Communication Skills, Technical Writing and Presentations and Functional English for 16 years each week to numerous regular students by providing comprehensive instruction on the use of English language. Provides analogies, group activities and prepare teaching plans that facilitate classroom participation. Adept at identifying the strengths and weaknesses of each student through diligent observation and interaction he astutely stresses on both hard and soft skills related to teaching. Examples of hard



skills include curriculum development, lesson planning, and classroom management. Examples of soft skills include communication, problem solving, and the ability to motivate students. An agent for positive change, he believes that researching the past is vital in understanding the present.

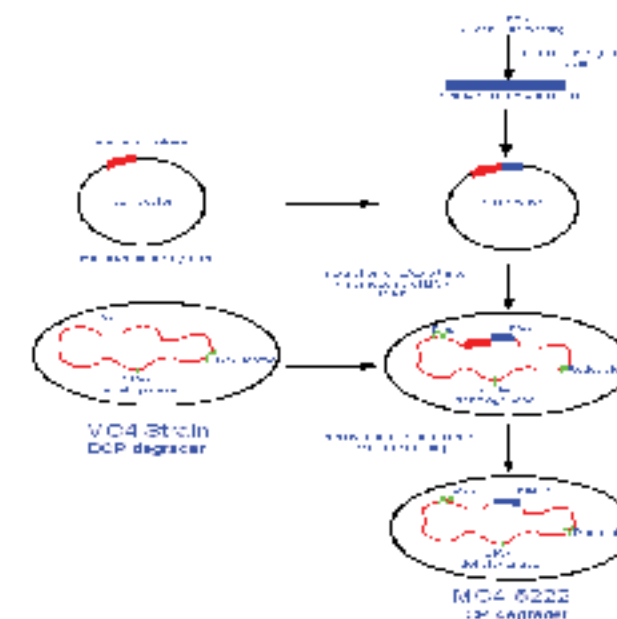
The Role of Transposon system in Genetic Engineering

BY DR. GHUFRANA SAMIN

There are many man made compounds posing serious risk to human health. Some of them are very carcinogenic. A suitable approach is required to degrade them. A classical method of their degradation is by means of microorganisms. Many naturally occurring bacteria have been isolated and their genes have been identified to have better insight of their metabolic pathways. Yet there are many compounds which are very recalcitrant and indeed it is very difficult to degrade them. To deal this, genetic Engineering is introduced in which genes are either introduced or modified according to the requirement. The specific genes encode specific enzymes required to convert a compound into further compounds till complete mineralization is achieved.

Genes are introduced into plasmids and plasmids carry some antibiotic markers. Plasmid carrying genes are under the promoter to control their production. Such genetically modified organism are very attractive but still there are many limitations. For instance, introduction of antibiotics in environment is not a good idea plus plasmids could easily jump out of bacteria under selective pressure. Such limitations are overcome by use of transposon system. Lorenzo and his team introduced mini Tn5 transpos-

on system [1]. It was successfully used by Samin and co-workers to introduce foreign genes on chromosome to construct more stable genetically modified organisms plus it was antibiotic free organism. The efficiency of such genetically modified organisms was checked in packed bed bioreactor as well [2].



Overall scheme of work is as described in diagram.

1. Lorenzo, Víctor & Herrero, Marta & Sánchez, Juan & Timmis, Kenneth. (1998). Mini-transposons in microbial ecology and environmental biotechnology. *FEMS Microbiology Ecology - FEMS MICROBIOL ECOL.* 27. 211-224. 10.1016/S0168-6496(98)00064-6.
2. Samin, Ghufra & Pavlova, Martina & Arif, Irfan & Postema, Christiaan & Damborský, Jiří & Janssen, Dick. (2014). A *Pseudomonas putida* Strain Genetically Engineered for 1,2,3-Trichloropropane Bioremediation. *Applied and environmental microbiology.* 80. 10.1128/AEM.01620-14.

Cancer, a huge challenge to treat

BY DR. SAJJAD AHMAD

Human bodies are made up of trillions of cells that over lifetime usually propagate or grow and rift as required. When cells are abnormal or get old, they usually die and new cells born. Cancer starts when something goes wrong in this process, cells keep building new cells, and the old or abnormal ones don't die when they should. As the cancer cells grow out of control, they can crowd out normal cells. Thus this uncontrolled, abnormal growth forming a lump called a tumor; this is true of all cancers except leukaemia (cancer of the blood). If left untreated, tumors can grow and spread into the surrounding normal tissue, or to other parts of the body via the bloodstream and lymphatic systems, and can affect the digestive, nervous and circulatory systems or release hormones that may affect body function.

Cancer tumors can be divided into three groups: 1)-benign, 2)- malignant or 3)-precancerous. Benign tumors are not cancerous and rarely threaten life. Malignant tumors are faster growing than benign tumors and have the ability to spread and destroy neighboring tissue. Upon invading healthy tissue at the new site, they continue to divide and grow. These secondary sites are known as metastases and the condition is referred to as metastatic cancer. Precancerous (or premalignant) describes the condition involving abnormal cells which may

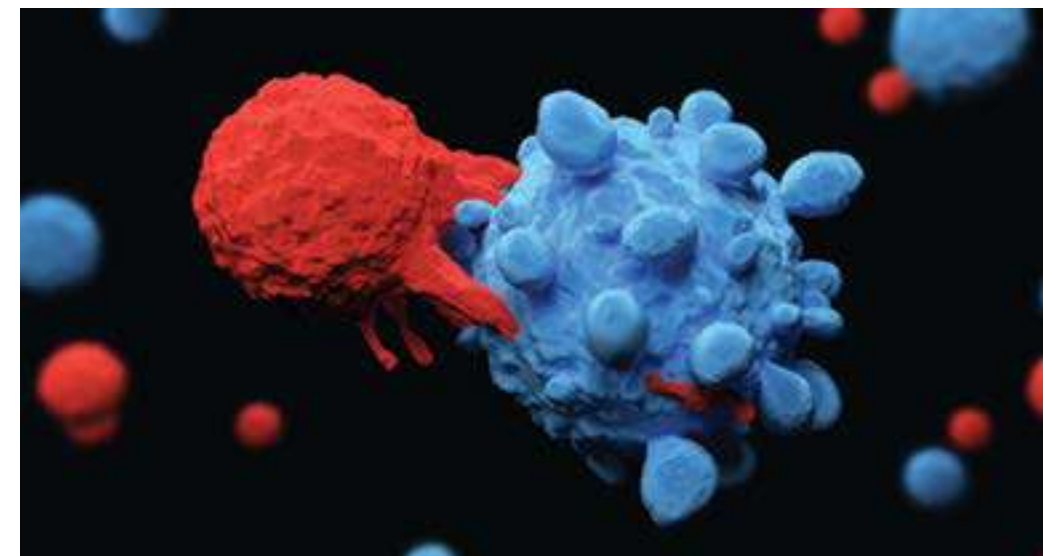
(or is likely to) develop into cancer.

Cancer is 2nd leading causes of morbidity and mortality worldwide with approximately 18.1 million new cases in 2020. Out of these 9.3 millions cases were in men while 8.8 million in women. Globally, nearly 1 in 6 deaths is due to cancer and is objected to increase by 45% in the period from 2007 to 2030 thus killing more people than HIV/ AIDS, malaria and tuberculosis combined. WHO estimates that the number of new cases is expected to rise by about 70% over the next 2 decades and it was also responsible for >10 million deaths in 2020.

The three most common sites of cancer diagnosed in human are breast, lungs and colorectum. Among Asian countries, Pakistan has the highest rates of breast cancer and 47% of the diagnosed breast cancers cases were already in an advanced stage. International Agency for Research on Cancer (IARC) has reported that in Pakistan, the proportion of newly diagnosed cancers is 0.18 million, the number of cancer fatalities is 0.11 million, and the number of prevalent cases (5 year) is 0.32 million. In Asia, Pakistan regionally represents the most significant breast cancer rate. Breast cancer has grown increasingly frequent in Pakistan, with one out of nine women now having a lifetime risk of the disease. Moreover, Pakistan has one of the highest breast cancer mortality rates globally. Lips and mouth cancer is the 2nd most frequent malignancy in Pakistan and the top

among males when both genders are included (15.9%). While lung, oesophagus and colorectum are at number 3, 4 and 5 respectively.

it is clear that PKCs are associated with a number of diseases and most importantly breast cancer.



CAR-T cells (illustrated in red) target and can kill some cancer cells (blue) by making them swell and rupture, triggering dangerous inflammation in patients.

The cancerous cell curability via chemotherapy is attributed only to 11%. Other options to treat the cancerous cells are radiotherpahy, biomarker testing for treatment, hormone therapy, hyperthermia, Immunotherapy photodynamic therapy radiation therapy, stem cell transplant and surgery. Various chemotherapeutic medicines are in market which have adverse side effects and low efficacy. So development of the effective chemotherapeutic medicine with improved efficacy is one of the bigger objective in 21st century. Various researchers are working day and night in their labs to develop the treatment options and working to produce the reasonable option to treat the cancer. At Faisalabad Campus of UET Lahore, our research group is working to improve the existing medication against breast cancer, We have focused on Protein Kinase Inhibitor (PKC). To date,

Our research aims at the development of PKC inhibitor by synthesizing the targeted compounds by utilizing the one-pot rearrangement and ring closing metathesis process combined with subsequent hydroxylation chemistry to facilitate easy access of target molecules. Later these new analogues will be screened for in vitro anti-cancer activity and also will be sent to our collaborators in UK for further studies. After related screenings, compounds will be subjected to clinical trials.

*(This article is for the common awareness and data, statments and statistics have been taken from the WHO, WCRF and ACS: Cancer Facts and Figures 2022)

Mathematics of Emerging Bio-medical imaging

BY DR. ARSHI KHALID

Recent advances in imaging technology allow evaluation of biologic processes and events as they occur in vivo. For example, new magnetic resonance and radioisotope imaging methods reflect anatomy and dynamic body functions. These methods give functional images of blood flow and metabolism essential to diagnoses and to research on the brain, heart, liver, kidneys, bone, and other organs of the human body.

Aforementioned studies have been aided by advances in the resolution of Imaging modalities which heavily rely on mathematical models and their solutions. Computational and mathematical methods are involved with imaging theories, models, reconstruction algorithms, image processing, quantitative imaging techniques, acceleration techniques, and multimodal imaging in medical imaging. One such domain of emerging biomedical imaging is inverse problems.

$$Y=A*X$$

Inverse problem is fundamental in neuroscience, as it gives insight about spatial and temporal activity in the brain for different tasks (Pascual-Marqui, 1999).

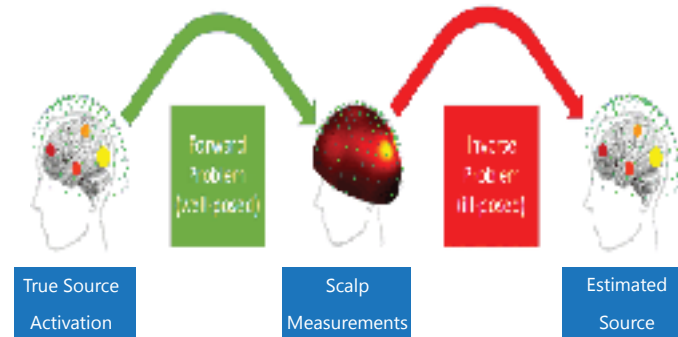


Figure: EEG forward and inverse problems: in the forward problem a well-posed model maps the true sources activation to the EEG measurement vector. In the inverse (and ill-posed) problem, an inverse operator maps the measurement vector to the estimated sources activation.

In electromagnetic imaging, one records electrical potentials created from currents inside or on the boundary of the object in arrays of electrodes around the object surfaces or magnetometers in small distance to the surface. The term imaging in such applications is often debated since the inverse problems are severely ill-posed and the reconstructions are hence of limited quality and mainly restricted to low frequency components. Due to the high remaining challenges in electromagnetic imaging, this is a very active field of research in applied mathematics, particularly in inverse problems.

In pure surface imaging of electrical activity created inside the object, a major challenge is the appropriate modeling of prior information to decrease or eliminate the nonuniqueness of

the reconstruction problem. The technology of electrical impedance tomography where different currents between the electrodes are sent into the body and the resulting potentials are measured, received enormous attention in inverse problems and is also known as the Calderon problem. The inversion can be formulated as reconstructing the conductivity in the Poisson equation from the knowledge of the Dirichlet-to-Neumann (or Neumann-to-Dirichlet) map, which has a rich mathematical structure. Thus EEG inverse problem is an illposed problem; hence, there is not a unique solution. To reconstruct an approximate solution, we need regularization techniques and mathematical methods like minimum norm estimates (MNE) (Grech et al., 2008) and low resolution electrical activity tomography (LORETA) (Grech et al., 2008, Pascual-Marqui et al., 2002, Pascual-Marqui et al., 1999).

These methods consider the relationship between the current sources and the measured potentials assuming a quasi-static approximation expressed by the lead field matrix (Weinstein et al., 1999). In this regard hybrid mathematical model find increasing attention.

An accurate solution of the neural source imaging problem can contribute to understanding the inner workings of the brain and to pinpointing regions with conductivity anomalies that might indicate damaged tissue.

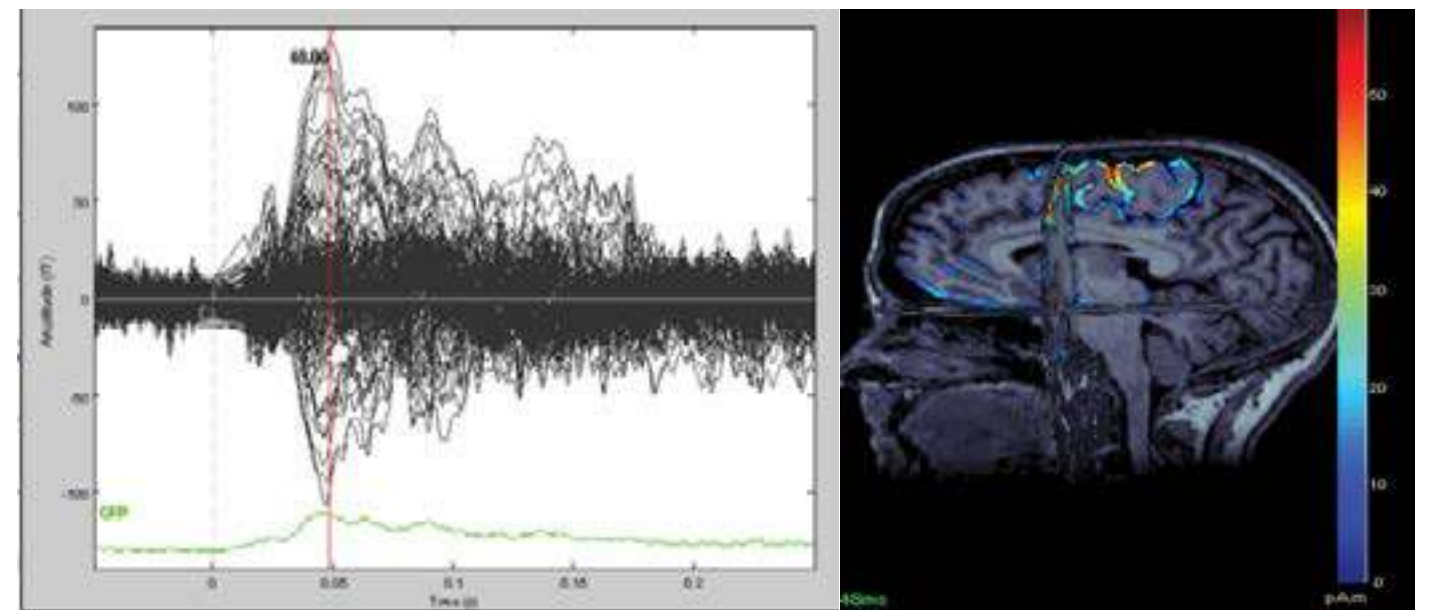


Figure: Time Series obtained from electrode representing power density of signal (on the left), source is localized for the activated part of brain (on the right).

New Trends in Mathematics and Applications To other Disciplines

BY DR. SHAZIA KARIM

Existence of Mathematics in our daily life is assured and is being used even when individuals don't understand they are using mathematical reasoning. They use all branches of Mathematics, not just traditional applied Mathematics. In last few years all mathematical activities like research, applications, education, exposition has changed. Some of these changes, like the use of computers are very noticeable and they are being applied in mathematical education broadly. Many new forms of mathematical activity like algorithms and programming, modelling, conjecturing, expository writing and lecturing are gaining worth.

Trends in Last Century

The 20th century is considered to be important in the foundation of Mathematics, it gave new approaches to Mathematics. David Hilbert (1862-1943) a famous mathematician presented a new vision to analyses axioms of each subject and state results in their full generality. This vision became stronger in 1930's through the developments of the axiomatic approach to algebra. New trends took place in Functional analysis with Banach spaces. This extent to other subfields of Mathematics like Differential

Equations, Algebra and Topology. In this century mathematicians developed new powerful Mathematical tools and inspired new applications that have resulted remarkable discoveries in other applied sciences. It opened new horizons for interdisciplinary research. The 20th century mathematics become more structured, diverse and complexed.

Trends in Mathematics Today

The areas of mathematics which are considered pure, are now being applied in different fields. Algebraic geometry is being applied in to control theory and study of large-scale systems; combinatorics and graph theory are applied to economics; the theory of fiber bundles is applied to physics; algebraic invariant theory is applied to the study of error-correcting codes. The methods derived in pure mathematics are widely used in developing analyzing and stability of results of many applied sciences.

Another trend which is important is that of general availability of the computers and its role in actually changing all the aspects of mathematics. The computer plays an entirely constructive role in our lives and in the evolution of our mathematics. The computer is changing mathematics by bringing certain

topics into greater prominence. It is even causing mathematicians to create new areas of mathematics, for examples, theory of computational complexity, the theory of automata, mathematical cryptology etc. At the same time, it is relieving us of certain tedious aspects of traditional mathematical activity which it executes faster and more accurately than we can. It makes it possible rapidly and painlessly to carry out numerical work, so that we may accompany our analysis of a given problem with the actual calculation of numerical examples.

Mathematics and Applications in different fields

Recently efforts are being undertaken to facilitate joint research across different academic fields to facilitate new interdisciplinary mathematicians and scientists.

New teaching strategies, simple applications and availability of computations with different computer software are now included in the study of mathematics. Topics like Geometry and algebra, Probability and Statistics, Iterative procedure, Paradoxes are now widely used.

Here are some other fields in which mathematics is playing a vital role

- Security issues (Mathematics for sensor, mobile communication and network security)
- Software reliability (mathematics for computer language, computer architecture)
- Automated Decision making (probability and stochastic analysis, pattern analysis

and spectral analysis)

- Communication systems
- Modelling and simulations
- Robotics and automation
- Applications in material sciences (mathematical models for synthesis and manufacture of polymers, these models are based on diffusion equation, analysis of stability and singularity of solutions for material sciences)
- Study of composites (vehicle companies are working for alternative of steel like silicon and aluminum, mathematicians have developed new tools in PDE's, and numerical analysis by which they can compute the affective properties of composites)
- Digital Technology (computer vision, image processing, statistical pattern, graph theory, graphic algorithms)
- Computer aided design (future of world wide web will depend on developing cryptographic schemes, discrete mathematics, algebraic geometry, dynamical systems)
- Medical Field (In mathematical modeling of cardiovascular systems, brain engineering, study of liver functions ect.

Every branch of Mathematics has important applications in other disciplines. This will effect on the mathematics curricula, levels of education system and teachers' trainings. New challenges are there for mathematicians in inter-discipline research and we can meet them by putting more efforts on research and can serve the mankind.

Amygdala and Emotions:

How Network Science helps to understand the structure and functions of the Brain

BY DR. MUHAMMAD YASIR

The sophistication of neuroimaging and the field of network science are enabling us to measure and model the architecture of structural and functional connections in the brain (Lynn & Bassett, 2019). The brain is an example of a complex network that consists of a huge number of interacting components. According to an estimation, that human brain network contains more than 86 billion neurons, 1 quadrillion synaptic connections, and 1 trillion bit/second equivalent processing (Azevedo et al., 2009; Changeux & Ricoeur, 2000). Therefore, to understand the operations of such an extremely sophisticated system in real time is a significant challenge. Other examples of complex networks include, The World Wide Web, telecommunication networks, social networks (real-world and online), transportation systems, and biological networks (Dalgard et al., 2015; Newman, 2003, 2006).

Interestingly, structural and functional brain networks as well as other complex networks share many common features, such as small-world topography, existence of highly connected hubs, and hierarchical modularity (Bullmore & Sporns, 2009; Meunier et al., 2009; Sporns et al., 2007; Watts & Strogatz, 1998). The

study of the brain as a complex network by using network science tools is underscored by numerous network changes that have been revealed in psychiatric and neurological disorders, including depression, epilepsy, schizophrenia, Alzheimer's disease, and many others. Network science is based on graph theory, statistical mechanics, data mining and information visualization, inferential modeling, and social structure from sociology. The brain can be analyzed thoroughly with the help of network science that provides a conceptual framework to study the structure and functions of complex networks. The amygdala is a well-studied brain area due to its role in processing of emotions and mental illness. Network science has recently been applied for analyzing the complex networks that mediate these processes. In network science, a complex network is represented as a graph as shown in

Figure 1.

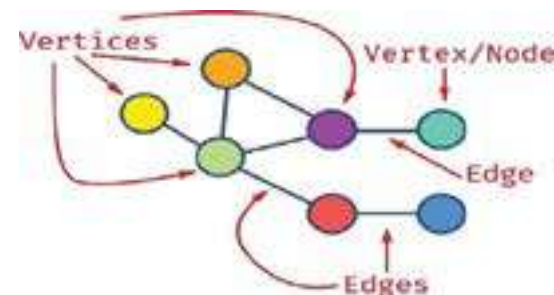


Figure 1: Graph representation of a network

After the graph is constructed, a variety of measures can be used to quantify the properties of the graph

- The degree of a node, k , is the number of edges that connect it to other nodes.
- The path length between any two nodes in a graph is the smallest number of edges that must be traversed to reach one node from the other.
- The clustering coefficient of a node quantifies the likelihood that neighbors of that node are also connected to each other. A high clustering coefficient indicates that a node is part of a group of well-connected nodes, known as a clique or cluster.
- The relative importance of a node within a network is referred to as its centrality.

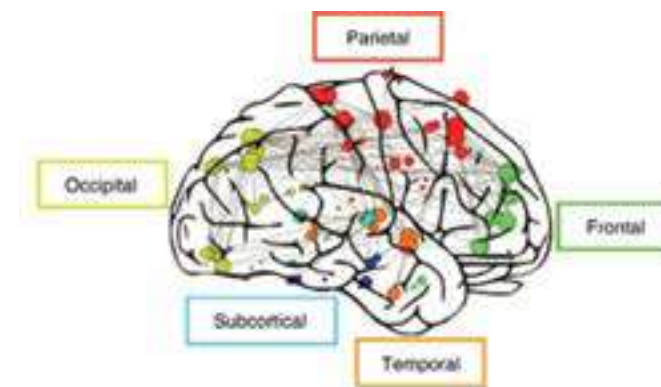


Figure 2: Representing the brain as a graph

Figure 2 represents the brain as a graph. Network science has identified that the centrality of amygdala is increased in networks for normal emotional processing and resting networks in depressed patients. Therefore, it confirms the importance of the amygdala in specific emotional processing tasks and reveals that depression happens due to an enhanced influence of

the amygdala in resting brain networks. Also, increased degree indicates that the amygdala has more or stronger connections to the rest of the network, whereas increased centrality depicts a higher percentage of shortest paths in the network pass through the amygdala. The depression is also associated with a rearrangement of modular structure, whereby the amygdala becomes a rich highly connected hub and a more important connector hub because of an increased number of intermodular connections.

How Will ChatGPT Change Education and Teaching?



BY MOHSIN SHERAZ

Chatbots like ChatGPT are transforming the field of education by providing personalized, responsive support to students. By simulating conversation with human users, these programs can help students understand difficult concepts, answer their questions, or even provide motivational messages to keep them on track.

One of the most promising applications of ChatGPT in education is providing personalized support. By responding to individual student needs, ChatGPT can help students achieve their academic goals more efficiently and effectively. Chatbots can also improve accessibility for students with disabilities or other special needs

by providing audio or visual cues and working with other assistive technologies.

ChatGPT can also enhance teacher support by providing real-time feedback on student progress and automating routine tasks like grading assignments or answering student questions. By freeing up more time for teachers to focus on teaching and interacting with students, ChatGPT can improve the overall quality of education.

In the future, ChatGPT could be used to personalize the learning experience even further by tailoring curriculum and assignments to individual student needs and interests.

Society of Basic Sciences Annual Dinner



Society of Basic Sciences (SBS) is founded in academic year 2022 by chairperson Dr. Sajjad Ahmad. Dr. Ghufrana Samin is the convener of the society. SBS aspires to achieve excellence in emanating quality education in the field of Mathematics, Chemistry, Physics, Environmental Sciences and Humanities.

An annual dinner was organized and hosted by SBS to present model of society and to appreciate the importance of science and culture in society. Students from all departments made the event a wonderful experience by performing different forms of art. Convener of the society is of the view that such events will not only provide faculty and students from all disciplines to celebrate the diversity among branches of science but to exchange and encourage ideas with each other. This event was organized under the supervision of Dr. Ghufrana Samin.



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Special Talk on Freelancing- What|Why|who

Freelancing has gained significant importance in today's economy for several reasons:

Flexibility

Freelancing offers the flexibility to work on your own terms, allowing you to choose the projects you're passionate about, set your own schedule, and work from anywhere. This flexibility provides a better work-life balance and the ability to pursue personal interests alongside your professional work.

Variety and Skills Development

Freelancers often work on diverse projects for different clients, which exposes them to a wide range of industries, challenges, and technologies. This variety helps freelancers develop a versatile skill set, adaptability, and a broader perspective, making them more marketable in the job market.

Increased Opportunities

Freelancing provides opportunities to work with clients globally. The digital age has made it easier to connect and collaborate with individuals and businesses from anywhere in the world. This expanded reach allows freelancers to tap into a larger client base and explore international markets.

Independence and Autonomy

Freelancers have the freedom to be their own boss. They can make decisions independently, set their rates, choose their clients, and determine their working conditions. This independ-

ence fosters a sense of empowerment and autonomy, which can lead to higher job satisfaction and motivation.

Career Growth and Networking

Freelancing exposes individuals to a wide network of professionals and potential clients. Building relationships and connections in the freelance community can lead to collaboration, referrals, and future opportunities. Additionally, freelancers can continually expand their knowledge and skills by working on diverse projects, enhancing their professional growth and marketability.

Entrepreneurial Experience

Freelancing often requires freelancers to handle various aspects of running a business, such as marketing, finance, and client management. This entrepreneurial experience can be valuable for those who aspire to start their own businesses in the future, as it provides insights into the challenges and dynamics of self-employment.

Overall, freelancing offers individuals the freedom, flexibility, and potential for growth and income that traditional employment may not provide. It has become a viable career path for many professionals seeking greater control over their work and lifestyle.



Department of Basic Sciences specifically designed a platform for sharing knowledge, insights, and experiences on the topics of interest through lectures and training sessions.



In this regard a special talk on freelancing was organized for the faculty and students.

Honorable speaker Mr. Husanin Awan, a top-rated freelancer with 100% client recommendation and more than hundred projects completed, presented a structured lecture on freelancing. This talk provided an opportunity for participants to learn, engage in discussions, and gain valuable insights from the speaker. More talks and training sessions are to be organized in future to play a crucial role in disseminating information, fostering intellectual growth, and inspiring individuals to explore new ideas and perspectives.



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2022



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Sports Gala 2023



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Prof. Dr. Sajjad Ahmad

