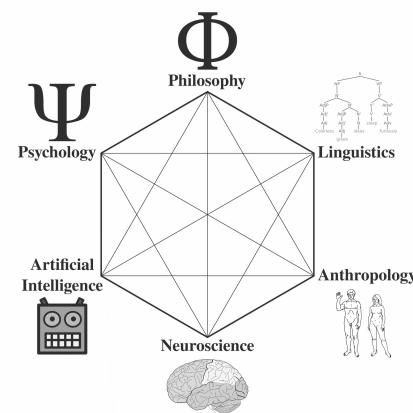


COGNITIVE SCIENCE

PLACEMENT BROCHURE 2023



INDIAN INSTITUTE OF TECHNOLOGY KANPUR



WHAT IS COGNITIVE SCIENCE ?

Cognitive science is an interdisciplinary field that strives to provide a unifying framework for the various facets of the inquiry into the nature of the human mind. The field represents the point of convergence of several other disciplines, including philosophy (knowledge representation, logic), psychology (basic human cognition, perception, and performance), computer science (computational theory, artificial intelligence, and robotics), linguistics (theories of language structure) and cognitive neuroscience (brain mechanisms for intelligent behavior).

Typical research areas of cognitive science include computational cognitive science, translational neuroscience, reasoning and decision-making, language comprehension and production, language acquisition, vision, attention, learning & memory, goal-directed movement in complex environments, and consciousness.

Cognitive Science has also brought together various fields of engineering by providing insights about user (human) behavior and cognitive processes to help in human-computer interface design and enhancing the usability of various products, i.e. usability engineering. It also studies behavioral deficits caused by congenital issues or traumatic brain injury. Defining protocol and aiding policies form another important facet of this science.



ABOUT US

CGS, IIT KANPUR

Cognitive Science Interdisciplinary Programme at IIT Kanpur was the result of coming together with faculty members from several different departments and domains of scientific study with a drive to investigate the human mind. The aim was to leverage the technical talent and infrastructure available at the institute to push forward frontiers of research in the field using a combination of computational and behavioral research.

Started in 2017, the Cognitive Science Program at IITK was one of the first of a handful of such offerings in India, and several other reputed universities, including other IITs, have since followed suit. The interdisciplinary nature of the program sets it apart from other cognitive science programs in the country, including other IITs. It is highly research-intensive, and students undertake multiple projects before beginning work on their thesis.



The Department of Cognitive Science was established in December 2020. Graduates from a highly research-oriented program like the CGS department at IIT-K are capable of a varied range of career profiles in both academia and the industry.

We seek employment opportunities in several up-and-coming areas like machine learning, cognitive computing, natural language processing, design, usability research, human factors, human-computer interaction (HCI), neuro-economics, decision making, cognitive and behavioral rehabilitation, advertising, and UX & UI design.

MESSAGE FROM THE DEPARTMENT

The Cognitive Science Department at IIT Kanpur sits, uniquely for a department in the IIT system, at the intersection between technology and behavior. How do you design a device interface such that it is accessible to all possible users? How do you measure remotely when someone is upset or bored? How do you create choice architectures that support climate conscious decisions? These are the sort of questions our MTech, MS and PhD students engage with as part of their curriculum, and that they build up skills to be able to answer.

We take pride in sending into the world, intellectually curious, scientifically skeptical, and socially aware young individuals, aware of both the power of technology, and its consequences for people and societies. They can both bang out code for your web service, and tell you why it won't engage users as currently designed. We welcome you, and are confident you would find the time you spend with our students interesting and productive.



Dr. Narayanan Srinivasan
Head of Department
Department Faculty Coordinator



Dr. Nisheeth Srivastava
Associate Professor
**Joint with Computer Science and
Engineering**

OVERVIEW OF PROGRAMMES OFFERED

CGS, IIT KANPUR

MS in Cognitive Science

M.Tech in Cognitive Systems

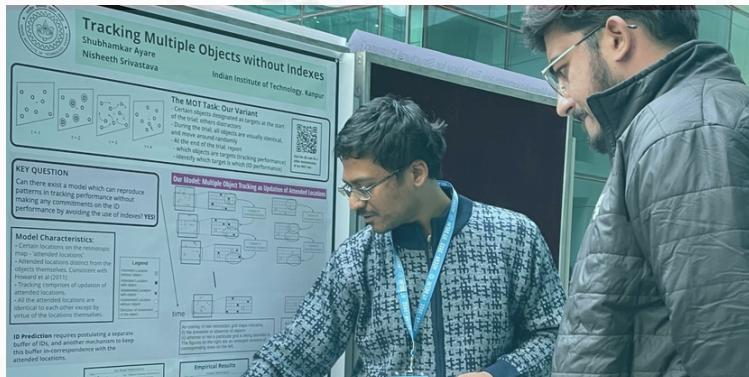
Ph.D. in Cognitive Science

Our students come from a variety of backgrounds, not limited to a Bachelor's or Masters's Degree in Cognitive Science and or related disciplines, including Engineering, Mathematics, Neuroscience, Psychology, Bio-sciences, Physics, Medicine, etc.

Given the interdisciplinary nature of cognitive science and the amount of emphasis on research, there are two components in the programs offered, i.e. a course component and a research component.

- The course component requires the students to take a number of compulsory courses and choose from a variety of electives, thereby helping the students gain the necessary footing for a uniform entry into Cognitive Science.
- The research component requires students to complete a research thesis under the supervision of one or more participating faculty, addressing a problem in the field of cognitive science using empirical, theoretical/computational, or a mixed approach.

Additional coursework may be credited or audited as per the current requirements for their respective research areas.



Core Coursework

- Computational Tools for Cognitive Science
- Basic Statistics, Data Analysis & Inference
- Eye-Tracking and VR
- Foundations of Cognitive Science
- Mind: Philosophical Investigations
- Experiment Design and Analysis
- Basics of Psychophysics
- Basics of EEG

Electives Offered

- Computational Cognitive Science
- Bayesian Models & Data Analysis
- Machine Learning
- Probabilistic Machine Learning
- Human-Computer Interaction
- Statistical Natural Language Processing
- Human-Centered Computing
- Cognitive Neuroscience
- Topics in Translational Neuroscience
- Neurobiology of Affect & Motivation

LABS & FACILITIES

Computing Facilities

- 7 System Servers, 3 Compute Servers, 5 Client Workstations
- Desktop Computers (with PsychoPy, OpenSesame, MATLAB, and others)



VR and Eye Tracking

- Oculus Rift S HMD
- HTC Vive Pro Eye HMD
- Tobii Fusion Eye Tracker
- Eyelink 1000 Plus (Sampling rate upto 2000 Hz.)
- Kinect and Ultra Leap Motion Sensors
- Virtualizer Elite 2 - VR Treadmill

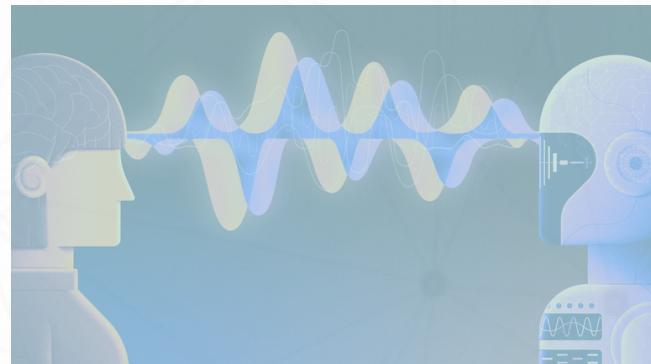


Neuroscience & Physiology

- MagVenture R30 TMS + Magoption (capable of Burst Stimulation, Pairedpulse protocols)
- 128 Electrode High-Density EEG
- Simultaneous Recording of Physiological Signals (Heart Rate, Respiration, Skin Conductance and Electromyography)

TECHNICAL SKILLS

- Applied Statistical Analysis
- Recommender Systems
- Designing and Conducting Experiments
(PsychoPy, Javascript, MATLAB, etc.)
- Data Analysis and Visualization (Python, R)
- Machine Learning and Artificial Intelligence



- Human-Computer Interaction
- Behavioral Analysis and Mathematical Modelling
- Game Design and XR (GameMaker Studio, Unity)
- Software Design and Development
- User Interface/Experience Design
- Neuromarketing & Product Design

ACTIVE RESEARCH AREAS

The department provides an excellent research platform and nurtures and challenges students to solve real-world research problems.

- **COMPUTATIONAL COGNITIVE SCIENCE:**

Faculty: Dr. Nisheeth Srivastava

- The emphasis is on the computational basis of learning and inference by mathematical modeling, computer simulation, and behavioral experiments. It is an approach that develops computational models based on experimental results and seeks to understand the basis behind the human method of processing information. The objective is to design self-learning systems that use Machine Learning and Data Mining algorithms, Neural Networks, and Visual Recognition to perform human-like tasks intelligently, with an emphasis on mimicking human behavior and reasoning to solve complex problems.

- **COMPUTATIONAL & TRANSLATIONAL NEUROSCIENCE:**

Faculty: Dr. Pragathi P. Balasubramani

- Computational and translational neurosciences goal is to comprehend the intricate workings of the brain and harness that knowledge for tangible benefits. Computational neuroscience employs mathematical models to simulate neural networks, unraveling the mechanisms underlying cognition and neurological disorders. In tandem, translational neuroscience transforms these insights into practical solutions, propelling laboratory findings into innovative clinical practices, personalized treatments, and even brain-computer interfaces. These insights not only revolutionize healthcare but also shape the landscape of artificial intelligence and robotics.

- **PERCEPTION, ACTION & COGNITION:**

Faculty: Dr. Devpriya Kumar, Dr. Narayanan Srinivasan

- The goal is to analyze sensory perception, motor response, and cognitive processes. Utilizing behavioral experiments, insights into human behavior and decision-making are extracted. In parallel, the integration of VR tools introduces ecologically valid simulations, permitting the manipulation of perceptual cues and motor reactions for insightful exploration. Using these tools, researchers can unravel the intricate web of complex cognitive processes in ways that were once inconceivable.

ACTIVE RESEARCH AREAS

- **SOCIAL AND AFFECTIVE COGNITION:**

Faculty: Dr. K. M Sharika

- Leveraging advanced methodologies, including eye tracking, behavioral tools, and modeling, this field delves into the intricacies of human behavior and cognitive processes in social contexts. Eye tracking uncovers visual attention patterns, revealing how individuals perceive and interpret social cues. Coupled with diverse behavioral tools, this approach provides a comprehensive understanding of responses to different stimuli. Additionally, modeling techniques enable the simulation and prediction of cognitive processes, enriching our comprehension of social and emotional dynamics and offering valuable insights into human behavior with practical applications in various industries.

- **LANGUAGE AND COGNITION:**

Faculty: Dr. Ark Verma

- Language and Cognition navigate a spectrum of cognitive psychology questions. From Laterality of Cognitive Functions to Attention and Perception, Visual Word Recognition, Bilingualism, and Corpus Linguistics, this multidisciplinary realm uncovers the intricate ties between language and thought. This synthesis of language and cognition enriches our comprehension of the human mind, fostering practical applications across various domains.



CONTACT US!

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