

PLACEMENT BROCHURE 2021



COGNITIVE SCIENCE



<http://cgs.iitk.ac.in/>

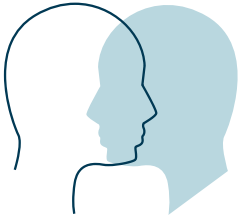
INDIAN INSTITUTE OF TECHNOLOGY, KANPUR



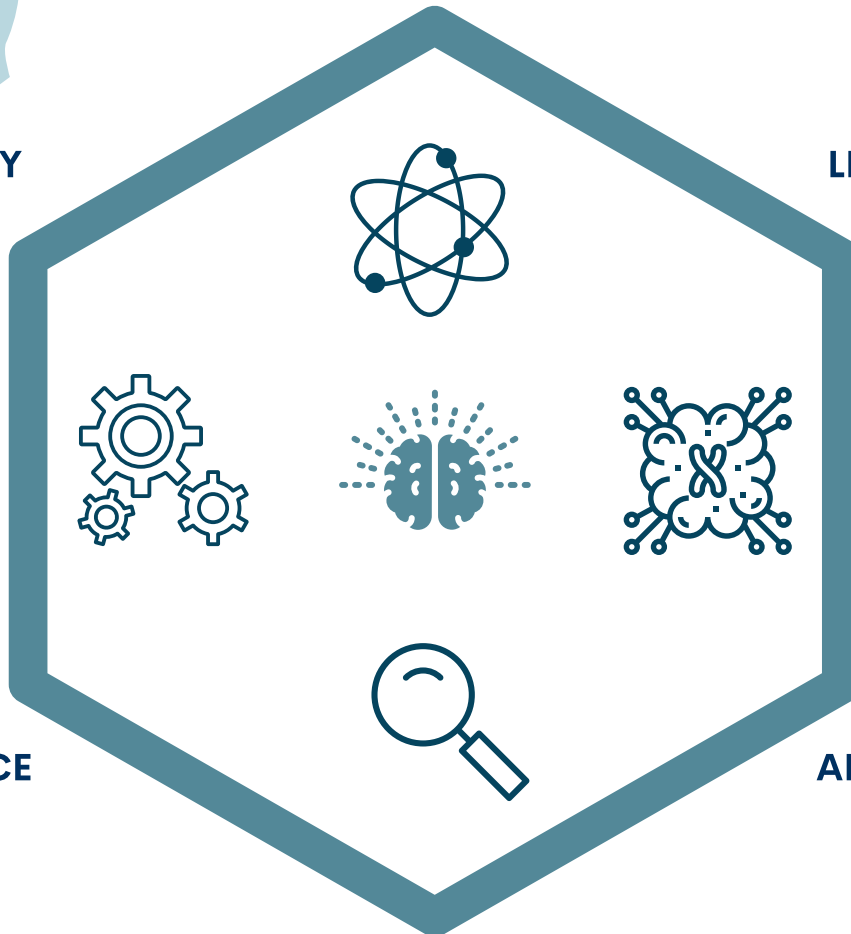
PHILOSOPHY



LINGUISTICS



PSYCHOLOGY

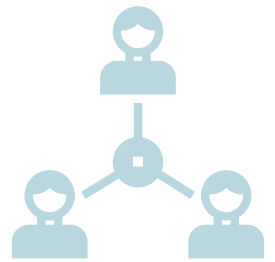


NEUROSCIENCE

ANTHROPOLOGY



**COMPUTER
SCIENCE & ROBOTICS**





What is Cognitive Science?

Cognitive science is an interdisciplinary field that strives to provide a unifying framework to 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).

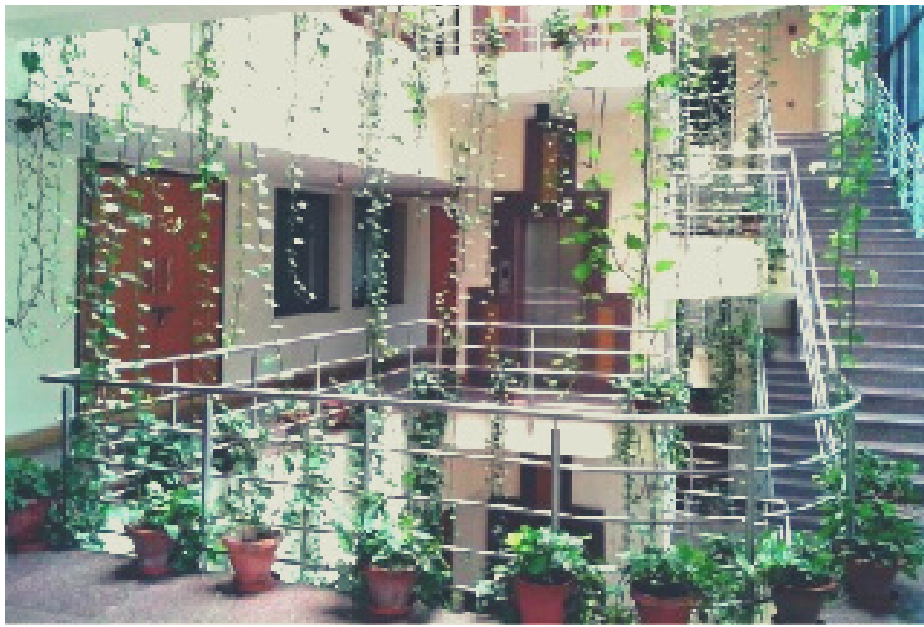
Typical research areas of cognitive science include reasoning and decision making, language comprehension and production, language acquisition, vision, attention, learning & memory, goal-directed movement in complex environments, and consciousness.

Cognitive Science has also brought together various fields of engineering by providing insights about user (humans) 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.

“Breakthrough innovation occurs when we bring down boundaries and encourage disciplines to learn from each other”

— Gyan Nagpal,
TALENT ECONOMICS: THE FINE LINE BETWEEN WINNING AND LOSING THE GLOBAL WAR FOR TALENT





ABOUT

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 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.

The focus is on creating researchers with a holistic knowledge of cognitive phenomena and tools used to study them.

- CGS
IIT KANPUR



Faculty Profiles

CGS, IIT KANPUR

Narayanan Srinivasan

Professor and Head, Department of Cognitive Science

Research Areas: Attention, Consciousness, Self and Agency, Time perception, Emotions, Decision making

Ark Verma

Assistant Professor, Department of Cognitive Science

Research Areas: Visual recognition, Corpus linguistics, Laterality of cognitive functions, Self, Attention, Perception and Social Cognition, Bilingualism

Devpriya Kumar

Assistant Professor, Department of Cognitive Science

Research Areas: Cognitive processing of perception and action, Intentionality and Sense of Agency.

Nisheeth Srivastava

Assistant Professor, Department of Computer Science

Research Areas: Decision making, Preference reversal, AI and autonomous control, Representation models for object recognition, Human factors in computing

Harish Karnick

Emeritus Fellow, Department of Cognitive Science

Research Areas: AI, Computational modelling of cognitive behaviour

K. M. Sharika

Assistant Professor, Department of Cognitive Science

Research Areas: Predictive Analysis of visible social Behavior, Valence based social decision-making, Control and influencing of attention and awareness, Emotion perception



Overview of Programmes Offered

CGS, IIT KANPUR

MS in Cognitive Science

Ph.D. in Cognitive Science

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

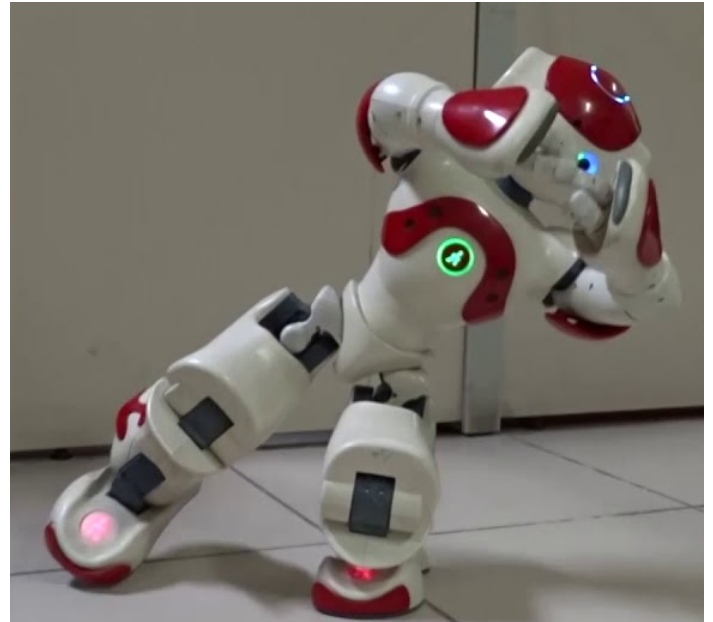
Additional coursework may be credited or audited as per the current requirements for their respective research areas.

Core Coursework

- Computational tools for Cognitive Science
- Fundamentals of Cognitive Psychology
- Basic statistics, data analysis and inference
- Methods and tools in Cognitive Science
- Cognitive Neuroscience
- Philosophy of Mind

Electives Offered

- Learning, Memory, and Cognition
 - Introduction to Natural Language Processing
 - Computational Cognitive Science
 - Topics in Cognitive Neuroscience
 - Human Cognitive Processes
 - Logic in Cognitive Science
 - Bilingualism
 - Bayesian Models and Data Analysis
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RESEARCH FACILITIES

To assist in the experimental work and other research components of our program, we provide quality infrastructural support to our students and faculties. Some of them include,

- Multiple high-performance servers for computational research.
- NAO - a robot for research into child-robot interaction,
- High-end workstations for psychophysics experiment and data analysis.
- Remote eye-tracking system.
- EEG wearable with both, 128 and 256 electrodes.
- Dedicated laboratories for conducting experiments using the above-mentioned equipment.



CORE SKILLS

- Programming : Python, MATLAB, R
- Design and Conduction of Experimental Studies (Online and Offline)
- Behavior Analysis
- Data Analysis and Visualisation
- Mathematical Modeling
- Conducting Original Research
- Technical and Academic Writing Expertise

ACTIVE RESEARCH AREAS

- Bio-Inspired Algorithm Optimization
- Human Reasoning and Decision Analysis
- Brain-Inspired Robotics
- Language Comprehension and Production
- Visual Perception and Attention Processes
- Concept Categorization
- Social Interaction and Group Dynamics
- Affective Cognition
- Usability Engineering and Digital Wellbeing

Recent Projects

CGS, IIT KANPUR

Designing Bio Inspired Strategies for Embodied AI

Nidhinandana Salian, Nisheeth Srivastava

This project involved work on developing a control system, for the development of low-cost, adaptive control systems for embodied AI. The resulting bio-inspired design is an efficient, lightweight control framework for intelligent agents that can operate autonomously in noisy, dynamic environments. The bots were also endowed with heuristic abilities to perform pursuit, patrol, and shielding tasks, and coordinate independently with other agents (if present). By an emphasis on the behavioral aspects of the system, the AI could be modeled as an evolving psychological organism, that acts in response to environmental determinants. As such, the system is both machine and domain-independent and can be modified to fit the world it is deployed in.

Degree of lateralization and handedness continuum

Anjoom Thahir A.V, Ark Verma

Left-handers have increased atypical lateralization for almost all known lateralized cognitive functions. Increased left-handedness and atypical lateralization in individuals with neurodevelopmental and psychiatric disorders also point to a deep but unresolved connection between handedness and functional hemispheric asymmetry. Non-dominant hand preference can end up being a confounding variable in many cognitive psychology experiments. Discrete classification of handedness dilutes the effects and misses the individual variations in the lateralization studies. Thus the entire handedness spectrum was considered in this project. We looked at how the degree of handedness varied the lateralization of cognitive processes (tool, action-word and symmetry processing). Handedness didn't show strong effects on the tool recognition tasks, probably because of poor tool image choice. But the degree of lateralization of both action-word and symmetry processing varies linearly with the handedness continuum. Our results suggest the existence of a psychological continuum that changes with the handedness continuum, a biological variable.

Recent Projects

CGS, IIT KANPUR

Perceptual saliency in rule-based categorization

Harish B, Harish Karnick

Living organisms demonstrate a remarkable ability to organize sensory experiences into groups. Such an organization aids the organism in navigating the complex environment efficiently and hence is imperative for its survival. The process of grouping stimuli into various classes is called categorization, and it leads to the formation of categories, which are the building blocks of knowledge. We, humans, adopt a variety of strategies to categorize stimuli. These strategies can be broadly grouped into rule-based and similarity-based strategies. This thesis investigates the role of perceptual saliency in rule-based categorization. Empirical evidence suggests that the perceptual saliency of rule components considerably influences the ease of learning simpler rules. However, the effect of saliency diminishes as the structural complexity of the rule increases.

The generalisation of Self Reference Effect

Neelabja Roy, Ark Verma, Harish Karnick

This thesis investigated whether the relative prioritization due to self-reference is limited to specific singular stimuli (triangle, quadrilateral) associated with socially salient labels (self, friend, stranger), or if one can also generalise the learned associations and reference-prioritisation to an entire category (all triangles, all quadrilaterals) where a category is defined by common simple visual features, (vertices). Participants either approached or avoided presented stimuli, using a manikin and key-press. The family of coloured shapes associated with 'Self' was approached faster than 'Strangers' and responses were also slower to avoid Self-related shapes than 'Stranger' related shapes.

The results demonstrate that the relative bias towards self-referential information may permeate the more generic processes of categorization and group behaviour as well, wherein even neutral stimuli (or individuals) perceived to be related to the self are not only processed faster and more accurately as opposed to information perceived as not relevant to ourselves. The effect extends to implicit groups with clear positive approach behaviour towards the Self-group and avoidance tendencies to the Strangers group.

Get in Touch!

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