

Project Title: **Assessment and Prediction of future events in younger and older drivers by means of assistive information**

Project Number **HSS1007**

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IITB Department:

Humanities and Social Sciences

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? (Please nominate JUST <u>one</u> . For more information, see www.iitbmonash.org)		Highlight which of the Academy's Theme(s) this project will address? (Feel free to nominate more than one. For more information, see www.iitbmonash.org)	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Artificial Intelligence and Advanced Computational Modelling
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Circular Economy
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Health Sciences
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Smart Materials
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Sustainable Societies
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng		
8	HSS, Design, Management		

The research problem

Define the problem

Handling complex systems, such as driving at automobile often impose multiple concurrent task demands on operators. Therefore, it seems to be reasonable to support the driver especially in her/his anticipation of critical future events (e.g. to draw attention to relevant environmental cues to remember intentions or to prepare adequate motor responses) over the entire range of time gaps between present activities and future events. Such kind of support seems especially helpful for older drivers because it is known that in older age deterioration of the brain begins primarily at frontal regions (e.g. Raz, 2000) which play a major role in planning, decision making, conflict resolution and executive functions (Craik & Bialystok, 2006). Two studies will be designed in which action preparation and prospective memory tasks are combined. In both studies a young and an old age group will be conducted in India as well as in Germany. As dependent measures we will record behavioral data (reaction time, driving performance, errors) as well as electrophysiological data (spontaneous and event related brain activity).

Project aims

1. Are there similar processes relevant (e.g. indicated by EEG and ERP patterns) in action preparation and PM tasks?
2. What kind of technical assistance may improve the anticipation of future events?

What is expected of the student when at IITB and when at Monash?

Student at IIT Bombay is expected to complete his/her course work, Literature review, and formulation of research problem, design, collection of data, interpretation, and writing the report. AI

Student at Monash University is expected to collect the data on both young and old driver, writing the report. Studies at both the places will be incorporated and combined results will be written and prepare the thesis.

Expected outcomes

We expect that we are able to replicate and extend the findings of advanced information in PM and action preparation research. Furthermore, by comparing and combining the two theoretical concepts we expect to gain a deeper insight into the role of preparation processes and memory processes on the mental construction of the future. As already mentioned above the findings of the collaborative project may be highly relevant for the development of intelligent driver support systems (IDSS) for standard cars as well as autonomous cars of different driving automation levels.

Potential RPCs from IITB and Monash

1. Prof. Avijit Maji, Transportation Systems Engineering, Civil Engineering, IIT Bombay. He has expertise in driving behaviour
2. Prof. Swati Pal, IDC School of Design, IIT Bombay, Mumbai. She has expertise in Cognitive Ergonomics and Design for elderly
3. Prof. Mrinmoyi Kulkarni, HSS, IIT Bombay, She has expertise in social psychology and health.

Capabilities and Degrees Required

M.Sc/M.A in Psychology /Neuroscience

B.Tech/M.Tech

Knowledge of E- Prime, Transportation Research, Eye-tracker, and EEG is desirable

Necessary Courses

1. Research Method
2. Statistics
3. Human Cognitive Process

Potential Collaborators

1. Professor Jennie Oxley, University of Monash
2. Prof. Avijit Maji, IIT Bombay

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

1. Transportation and Traffic Engineering and Logistics
2. Miscellaneous/Uncategorised
3. Signal Processing
4. Humanities