Vijeth Hebbar

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Education

PhD |Aerospace Engg.
UIUC | 2021-Present
- Research: Game Theory, Decision Making, Control
- Advisor: Cédric Langbort

MS |Aerospace Engg.
UIUC | 2019-20
- GPA: 4.00/4.00
- Thesis: Information Design in Human Robot Interaction

B. Tech |Aerospace Engg.
IIT Bombay | 2015-19
- CPI: 9.01/10.00 (with Honors)
- Minor in Systems and Controls Engineering
- Thesis: Optimal Sensing using Co-operative Ground Robots

Coursework

Controls
Optimal Control, Robust Control, Adaptive Control, State Estimation, Distributed Control
Decision and Information
Information Theory, Game Theory, Algorithmic Game Theory
Optimization & Stat
Numerical Methods, Optimization using Vector Space Methods, Random Processes. Graph Algorithms, Parallel Computing
Learning and AI
Reinforcement Learning, Statistical Learning Theory

Technical Skills

Programming
python • MATLAB • Simulink
c++ • c • Maple
CUDA • Mathematica
Engg. Tools
Solidworks • ROS • Arduino
XFoil • Tecplot • AutoCAD
AVR Studio • Gazebo • RasPi
Languages
English • French • Hindi

Research Interests

My current research focuses on understanding and modeling the role of information in the decision making process of strategic agents. In particular, I am interested in analyzing the robustness of existing *information design* techniques when information receivers exhibit model-deviant behaviours. In arriving at answers to these and many other pertinent questions I employ tools from the fields of game theory, learning and robust control.

Drawing from my experience with human-centric behavioural models, I am interested in developing human-centered AI systems capable of engaging in nuanced interactions with humans. I also have a keen interest in game theoretic approaches to challenges related to trustworthy and fair AI systems.

Research Experience

Learning with History Dependent Payoffs
Illinois, USA
Guide: Prof. Cédric Langbort | UIUC
Jan 2022 - Present

In many sequential decision making scenarios, the outcome of decisions depends not just on the current decision but also on past ones. Unfortunately, in many cases we can show that such history dependency makes it impossible for a learner to do well in the long run. On the flip side, under some restrictions we can show that no-regret algorithms are indeed possible.

Role of Identity in Info Exchange and Decision Making
Illinois, USA
Guide: Prof. Cédric Langbort | UIUC
Jan 2021 - Jul 2022

Social identity affects decision making and how receivers shape their beliefs after receiving new information. This work seeks to quantitatively model and understand this phenomenon with the aim of designing communication mechanisms robust to the deleterious effects of identity. This work was done in collaboration with psychologists and economists both from Stanford and UIUC.

Stackelberg Signaling Game in Search-and-Rescue Context
Illinois, USA
Guide: Prof. Cédric Langbort | UIUC
Aug 2019 - Dec 2020

- Modelled a human robot interaction scenario in a game theoretic framework
- Designed an optimal signaling policy for the autonomous agent to influence human behaviour
- Robustified these signaling policies to uncertainties in the agent behaviour as well as environmental uncertainties

Optimal sensing using co-operative ground robots
Mumbai, INDIA
Undergrad Research | Guide: Prof. Sukumar Srikant | IIT Bombay
2018-2019

- Simulated convergence of consensus-based sensing algorithm to optimal configuration
- Implemented the decentralized consensus algorithm in non-holonomic bots, used RasPi and ROS network

Nonlinear Robust Control in Parrot Minidrones
Montréal, CANADA
Research Intern | Guide: David Saussié | Ecole Polytechnique
Summer 2018

- Performed system identification for Parrot®Rolling Spider drone
- Designed a sliding mode controller (SMC) and an adaptive controller for trajectory tracking
- Used Simulink® Parrot Minidrone package
- Mitigated chattering effect in SMC using a modified, differentiable control law

Other Projects

Triangulation based localisation of robots
Reinforcement learning crawler bot
Implemented SLAM in a ground bot.

Teaching

UIUC | student instructor
Fall '23, Spring '22

- AE352: Dynamical Systems
- Lectures to class of 80+ students

Extra-curriculars

Drums • Climbing • Mountaineering • Swimming

Technical Experience

Control algorithm development in Pluto mini-drone Mumbai, INDIA
Student Developer | Drona Aviation Dec 2017 - Apr 2018

- Evaluated the flight capabilities of the Drona® Pluto mini-drone
- Implemented and tested various control algorithms and flight trajectories

Rakshak: Autonomous disaster-relief UAV Design Team Mumbai, INDIA
Junior Design Engineer | Instrumentation Oct 2015 - Dec 2016

- Automated the drone using Pixhawk module, aimed to participate at AUVSI SUAS
- Established communication links between the UAV and ground station over a ROS

Papers

- V. Hebbar and C. Langbort,"On The Role of Social Identity in the Market for (Mis)information." *CDC 2022*.
- Hebbar, V.; Langbort, C. "A Model for Tacit Communication in Collaborative Human-UAV Search-and-Rescue." *Entropy 2021*
- Hebbar, V., & Langbort, C. (2020). "A stackelberg signaling game for human-uav collaboration in a search-and-rescue context." *CPHS 2020*

Awards and Achievements

Robert Beatty fellowship for top incoming graduate students at UIUC [2019]
Academic Excellence Award for ranking 1st in the department [2018]
Kishore Vaigyanik Protsahan Yojna (KVPY) Fellowship [2014]

Positions of Responsibility

- CSL Student Conference - Session Co-Chair [UIUC - 2023]
- Hostel Secretary for Technical Affairs [IIT Bombay - 2016-17]
- Mood Indigo - Event Coordinator [IIT Bombay - 2016]