SHASHI KANT GUPTA

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EDUCATION

Indian Institute of Technology, Kanpur, India
Major in Electrical Engineering with Minor in Cognitive Science — *Aug. '16 – Jun. '20 (Expected)*
GPA: 8.84/10.0 *(Five Semesters)*

Munam Public School, Hazaribagh, India
Intermediate
Percentage: 91.2% — *April 2016*

DAV Public School, Hazaribagh, India
Matriculation
GPA: 10.0/10.0 — *April 2014*

PUBLICATIONS

Vishal Choudhary, **Shashi Kant Gupta**, Shaohui Foong, Hock Beng Lim "Distance Measurement for UAVs in Deep Hazardous Tunnels", Demo Paper accepted at IEEE Consumer Communications & Networking Conference (2019 IEEE CCNC), Las Vegas, USA

HONORS & ACHIEVEMENTS

- Selected for a Summer Internship at **SUTD Singapore** in the second year (2018)
- Received **Academic Excellence Award** twice for outstanding academic performance (awarded to top 7% of students in the institute) for the year 2016 and 2016-17
- Only first year student to be selected to deliver a campus level lecture (on **ROS**) during summer '17
- Won **3rd prize** in Techkriti Innovation Challenge, conducted by Techkriti IIT Kanpur (2017).
- **99.89 percentile** in Joint Entrance Examination (**IIT-JEE 2016)** among 1.5 million students.
- Secured **All India Rank 842** in **KVPY 2015,** a fellowship exam conducted by IISc Bangalore and funded by Department of Science and Technology, Govt. of India

INTERESTS

Artificial General Intelligence • Cognitive Science • Computer Vision • Cognitive Neuroscience • Psychology

RESEARCH EXPERIENCE

Bridging Deep Learning and Neuroscience — *Dec. '18 – Ongoing*
Prof Nisheeth Srivastava, IIT Kanpur
- **Approach 1:** Deriving learning rule based on STDP found in Biological Neurons
- **Approach 2:** Studying the weight change during backprop to make connection to biological learning

Role of Emotional Valence on Sense of Agency — *Dec. '18 – Ongoing*
Prof Devpriya Kumar, Center for Cognitive Science, IIT Kanpur
- Studying the influence of emotional valence of an action outcome on sense of agency by designing an experimental setup.

Optical Flow for Localisation of UAVs in Deep Tunnel — *Jun. '18 – Jul. '18*
Summer Internship, Dr Hock Beng Lim, Centre for Smart System, SUTD Singapore
- Worked on the **Optical Flow** algorithm based on **SAD block matching** to determine UAV position in deep tunnels i.e. GPS denied environment (coded in python, for actual prototype **PX4FLOW** was used)
- Developed a self-prediction based algorithm to correct the errors in inconsistent flow calculation
- Performed various experiments to collect data samples to measure and analyse performance
- Worked on implementing **Extended Kalman Filter** to use acceleration data to improve accuracy
- Demo Paper accepted at IEEE Consumer Communications & Networking Conference, Las Vegas, USA

Humanoid IITK — *Dec. '16 – Ongoing*
Team Member, Dean of Research and Development Project, IIT Kanpur
Faculty Advisor (Jul. '18 Onwards) - Dr Ashish Dutta, IIT Kanpur — ***[Video]***
- Helped the team in designing and developing the **Institute's first Humanoid Robot (AUTOMI)**
- Worked on developing the **bipedal walking algorithm**, designed a MATLAB simulation for the same
- Worked on **Object Tracking** using various computer vision algorithms in OpenCV

OTHER RELEVANT PROJECTS

How Close are Artificial Neural Networks to the Brain? — *Sep. '18 – Nov. '18*
CS771A - Machine Learning, Prof Piyush Rai, IIT Kanpur — ***[Pres.] [Report]***
- Studied different types of **ANN** models to compare their structure and performance to realise their biological resemblance to the processing in the brain
- Trained several neural network models on **MNIST** dataset to play with modeling of **CNN** and **RNN**.
- Tried explaining how a rate based neuron in conventional NN can be realised as spiking neuron in **SNN**
- Worked on a more biologically plausible Deep Learning model (continued as a separate project)

Real Time Human Facial Emotion Recognition *Nov. '18 – Ongoing*

Self Project ***[Video] [Code]***

- Extracts human faces (using OpenCV haar-cascade/ dnn based classifier) from a camera stream and classifies them into 7 different moods i.e. Angry, Disgust, Fear, Happy, Sad, Surprise and Neutral
- CNN classifier (with ensemble) was designed, which was trained on the **ICML 2013** dataset of Facial Expression Recognition Challenge on kaggle to achieve an accuracy of ~**65.34%** on the private test data

Cooperative Localization Using Posterior Linearization Belief Propagation *Sep. '18 – Nov '18*

EE602A – Statistical Signal Processing, Prof R. M. Hegde, IIT Kanpur ***[Code] [Report]***

- Implementation of a research paper, which presents the **PLBP** algorithm for cooperative localization
- Learned about and implemented Statistical Linear Regression using **unscented transform** on a chosen sets of **sigma points** to linearise the proposed non-linear model.
- Implemented the **Belief Propagation** algorithm to infer the marginals for different sensor nodes.

Achieving CRLB in Sensor Network Estimation *Sep. '18 – Nov '18*

EE602A – Statistical Signal Processing, Prof R. M. Hegde, IIT Kanpur ***[Code]***

- Implementation of a research paper, which proposes a general framework to achieve CRLB bounds
- Successfuly implemented the proposed method in MATLAB to produce the results

PixhawkArduinoMAVLink *Jun. '18*

Self Project ***[Code]***

- Developed an Open Source Arduino library to communicate between Pixhawk and Arduino
- Used **MAVLink** messaging protocol to create the communication

SL-COM (Sign Language Communication) *Mar. '17*

Robotics Club, IIT Kanpur

- Patterns were generated using different **hand gestures** to produce different letters
- Produced letters were sent to a Chat-App, were a text2speech engine produces voices for the words
- Demonstrated the prototype in **Techkriti Innovation Challenge** and was awarded the **3rd prize**

RELEVANT COURSES

Machine Learning and Computer Vision

- Introduction to Machine Learning
- CNN for Visual Recognition (Stanford AI) [#]
- Computer Vision: Foundations and Applications (Stanford AI) [#]

Signal Processing

- Statistical Signal Processing
- Signals, Systems And Networks

Cognitive Science

- Foundation of Cognitive Science
- Psychology of Language [o]
- Computational Cognitive Science [o]
- Neuronal Dynamics (Prof Gerstner) [#][o]

Mathematics and Algorithms

- Data Structures & Algorithms
- Fundamental of Computing [*]
- Probability and Statistic
- Linear Algebra and ODE

** - Exceptional Performance* *# - Online (Audit)* *o - Ongoing*

TECHNICAL SKILLS

Languages: C • Python • Matlab • JavaScript

Software and Tools: TensorFlow [Keras] • Brian (beginner) • OpenCV • NumPy • ROS (Robot OS) • Git • Arduino • HTML/CSS • Jekyll

LEADERSHIP & ACTIVITIES

Student Volunteer *PRAYAS, IIT Kanpur* *Dec. '18 - Present*

Students Project Coordinator *EEA, Dept. of Electrical Engineering, IIT Kanpur* *Sep. '18 - Present*

Technical Head *Humanoid IITK Team, IIT Kanpur* *May. '18 – Nov '18*

UG Coordinator *EEA, Dept. of Electrical Engineering, IIT Kanpur* *Aug. '17 – Aug. '18*

Secretary *Robotics Club, IIT Kanpur* *Apr. '17 – Mar. '18*

Secretary *Fine Art Club, IIT Kanpur* *Apr. '17 – Mar. '18*

Student Guide *Counselling Service, IIT Kanpur* *Aug. '17 – Jul. '18*

Student Volunteer *NSS, IIT Kanpur* *Aug. '16 – May. '17*