

# ANURENDRA KUMAR

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## RESEARCH INTEREST

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Machine Learning; Explainable Artificial Intelligence

## EDUCATION

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**University of Illinois at Urbana-Champaign**

M.S., Computer Science

**Indian Institute of Technology (IIT), Kanpur**

M.Tech, Electrical Engineering

B.Tech, Electrical Engineering

Minors in Artificial Intelligence, Linguistics

*Aug '19 - May '21*

GPA: 4/4

*Jul '12 - May '17*

GPA: 9.67/10

GPA: 8.0/10

## WORK EXPERIENCE

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**Graduate RA, Prof. Kevin Chang, UIUC**

*Web Information Extraction*

*Aug'19 - Present*

[\[Link\]](#)

Developed a large dataset and a novel scalable deep learning architecture for web information extraction. Inspired by the recent advances in CV and NLP, we propose a self attention based architecture for optimal contextual learning. The proposed model is promising because it is optimized to exploit visual features from semi-structured data eg. webpage.

**Lead, Data & Artificial intelligence, Startup Project**

*Jan'18 - Mar'19*

[NDA restricted] Developed and validated machine learning algorithms for futuristic finance services. My work included- i) Designing statistical framework for risk assessment and mitigation in our platform, ii) Modeling and prediction of time-series data when very less training data is available, iii) Explainability of machine learning algorithms.

**Research Intern, IBM Research Lab**

*Hierarchical sparse representation of Knowledge base(KB)*

*Jun'17 - Aug'17*

[\[Presentation\]](#)

Developed an algorithm for representation learning of KB exploiting the existing tree structured hierarchy.

**Extreme Blue Intern, IBM**

*Internet of Things (IOT) in Agriculture*

*May'16 - Jul'16*

[\[Video\]](#)

Developed the prototype for precision agriculture in India. Our foundational work later developed into full fledged system and won the prestigious **AEGIS GRAHAM BELL AWARD** .

**Research Associate, IIT Kanpur-ISRO Collaboration**

*Remote sensing image quality evaluation*

*Aug'17 - Dec'17*

[\[Presentation\]](#)

Developed a no reference metric for quantifying the remote sensing image dynamics using dictionary learning.

**Research Intern, Samsung**

*May'15 - Jul'15*

**Data Science Intern, Rivigo**

*May'19 - Aug'19*

## PUBLICATIONS

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**A. Kumar**, T. Guha, P. Ghosh, 'A Dynamic Latent Variable Model for Source Separation', Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP'18) [\[Link\]](#)

Developed a novel latent variable model for time-varying non-negative data. Proposed a novel prior distribution which is particularly suitable for dynamic non-negative data. It also lead to connecting our model to the two popular latent basis learning methods - PLCA and NMF.

**A.Kumar**, T.Guha, P.Ghosh, 'Dirichlet Latent Variable Model: A Dynamic Model Based on Dirichlet Prior for Audio Processing', **IEEE Transaction on speech and language processing** (2019) . [\[Link\]](#)

Extended above model to incorporate multi-order bidirectional dependency and to newer applications.

L.Pandey<sup>+</sup>, **A.Kumar**<sup>+</sup>, V.Namboodiri, 'Monoaural audio source separation using variational autoencoders', **Inter-speech**'18 (+ denotes equal contribution) [\[Link\]](#)

Proposed a principled generative approach using variational autoencoders (VAE) for audio source separation. VAE computes efficient Bayesian inference which leads to a continuous latent representation characterizing each source. Our method performed better than best of the relevant methods with 2 dB improvement in the source to distortion ratio.

## TECHNICAL SKILLS

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Strong: Python, Pytorch, Matlab, Latex

Medium: C, C++, R, Javascript, Tensorflow, Caffe

## SHORT PROJECTS

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### Multiple Word Vector Embedding for polysemous words

*Sep' 15 - Nov'15*

*Prof. A. Mukherjee, IITK*

[\[Project Material\]](#)

Extended word vector model to have multiple representations for polysemous words. Our primary contribution was in developing a non-parametric approach to clustering for optimal number of senses.

### Automatic wheat grain quality estimation

*Aug'16 - Nov'16*

*Prof. T. Guha, IITK (**Best project** in Image Processing course)*

[\[Report\]](#)

Developed a proof-of-concept for quality estimation of grain from the image of a grain sample. Created a labeled data-set with the help of traders and farmers. Proposed a novel segmentation algorithm followed by classification.

### Visual Odometry in Self-Driving Car

*Sep'15 - Nov'15*

*Prof. G. Pandey, IITK*

[\[Project Material\]](#)

Developed and implemented visual odometry in self-driving car using opencv library in C++. SIFT and FAST features were extracted in each frames. KLT tracker with RANSAC for outlier rejection was employed for tracking features.

### Video segmentation

*Jan'16 - Apr'16*

*Prof. V. Namboodiri, IITK*

[\[Project Material\]](#)

Improved graph-based hierarchical segmentation in videos for both the online and offline segmentation.

### Multiple Kernel Learning (MKL)

*Sep'15 - Nov'15*

*Prof. H. Karnick, IITK*

[\[Project Material\]](#)

Implemented and performed experiments to show that MKL automatically learns the efficient weighted distribution of multiple kernels and have the potential to handle data coming from heterogeneous sources.