

# ANURENDRA KUMAR

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**RESEARCH INTERESTS:** Machine Learning; Explainable Artificial Intelligence

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## EDUCATION

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**University of Illinois at Urbana-Champaign**

*Aug '19 - May '21*

M.S., Computer Science

GPA: 4/4

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

*Jul '12 - May '17*

M.Tech, Electrical Engineering

GPA: 9.67/10

B.Tech, Electrical Engineering (Minors in Artificial Intelligence (AI), Linguistics)

GPA: 8.0/10

## WORK EXPERIENCE

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

*Aug'19 - Present*

*Web Information Extraction*

[\[Link\]](#)

Developed a large labeled dataset of product webpages and a novel deep learning architecture for web information extraction. Formulated the problem as a language model aimed to learn visual grammar from webpages. Inspired by the recent advances in CV and NLP, we propose a self attention based CNN architecture for optimal contextual learning.

**Independent Research, Prof. Saurabh Sinha, UIUC**

*Jan'19 - Present*

*Causal generative modeling for gene regulation*

Developing a biologically aware GAN for single cell transcriptomics. Proposed a group sparsity based DNN for causality.

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

*Jan'18 - Mar'19*

[NDA restricted] Developed multiple algorithms (eg. ARIMA) and benchmarking metrics (e.g. bootstrapping) for various finance services eg. credit scoring, risk estimation and portfolio optimization. Designed explainability of AI techniques.

**Research Intern, IBM Research Lab**

*Jun'17 - Aug'17*

*Hierarchical sparse representation of Knowledge base(KB)*

[\[Presentation\]](#)

Developed a model to learn the vector representation of entity and relations in KB. Proposed- i)a tree structured prior to model hierarchy, ii)a proximal gradient algorithm to deal with non-smoothness.

**Extreme Blue Intern, IBM**

*May'16 - Jul'16*

*Internet of Things (IOT) in Agriculture*

[\[Video\]](#)

Worked on crop health monitoring from the near infra red (NIR) and RGB crop images. Deployed various sensors using arduino. Our prototype later developed into a full fledged system and won the **AEGIS GRAHAM BELL AWARD**.

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

*Aug'17 - Dec'17*

**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 dynamic latent variable model for time-varying non-negative data. Proposed a novel prior distribution which is particularly suitable for dynamic non-negative data and yields elegant update equations. 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.

**A.Kumar<sup>+</sup>**, L.Pandey<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

Prof. A. Mukherjee, IITK

Sep'15 - Nov'15

[\[Project Material\]](#)

Extended word vector model to have multiple representations for polysemous words. Proposed two parametric and two non-parametric solutions. Our primary contribution was in developing a non-parametric approach to clustering for optimal number of senses. The solutions were evaluated on four evaluation metrics. Proposed solutions beat state-of-the-art in several specific cases.

### Visual grain quality estimation

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

Aug'16 - Nov'16

[\[Report\]](#)

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 two-level segmentation method to segment overlapped grains which were further classified as grains/ impurities demonstrating the performance of proposed technique.

### Visual Odometry in Self-Driving Car

Prof. G. Pandey, IITK

Sep'15 - Nov'15

[\[Project Material\]](#)

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

Prof. V. Nambodiri, IITK

Jan'16 - Apr'16

[\[Project Material\]](#)

Improved graph-based hierarchical segmentation in videos for both the online and offline segmentation. Proposed a preprocessing step which segments videos using shot transition detection. The proposed method performed better than state-of-the-art on all (four) evaluation metrics, for instance, *3D Undersegmentation Error*.

### Multiple Kernel Learning (MKL)

Prof. H. Karnick, IITK

Sep'15 - Nov'15

[\[Project Material\]](#)

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.