ANURENDRA KUMAR

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RESEARCH INTERESTS: Machine Learning; Explainable Artificial Intelligence

EDUCATION

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

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.

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

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^{+}, L.Pandey^{+}, V.Namboodiri, 'Monoaural audio source separation using variational autoencoders', **Interspeech**'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

Strong: Python, Pytorch, Matlab, Latex || Medium: C, C++, R, Javascript, Tensorflow, Caffe

SHORT PROJECTS

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. 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 *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 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 *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. 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) *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.