

Deepali Jain

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RESEARCH INTERESTS

Reinforcement Learning, Natural Language Understanding, Knowledge Representation and Reasoning

EDUCATION

- **Indian Institute of Technology Roorkee** Roorkee, India
• *Bachelor of Technology in Electrical Engineering* 2012 – 2016

RESEARCH LAB EXPERIENCE

- **Adobe Research, Big-Data Experience Lab**, Research Fellow June 2016 - Present
- **Adobe Research, Big-Data Experience Lab**, Research Intern May 2015 - July 2015

AWARDS AND ACHIEVEMENTS

- **Winner, Microsoft Code.Fun.Do**, IIT Roorkee 2015
- **National Finalist, GSQuantify Data Science Challenge**, Goldman Sachs 2015
- **Winner, Ideaz Paper Presentation Contest**, IIT Roorkee 2015
- **National Winner, IEEE Programming League** 2015
- **Air Cmde S.C. Mehra Scholar**, IIT Roorkee 2012
- **K.V.P.Y. Fellow** 2012
- **National Talent Search Examination Scholar** 2008

PUBLICATIONS AND PATENTS

- **An LSTM Based System for Prediction of Human Activities with Durations**
Kundan Krishna¹, Deepali Jain, Sanket Mehta, Sunav Chaudhary
Accepted to be published in Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (To be presented in UbiComp 2018)
- **Fairness Aware Recommendations on Behance**
Natwar Modani, Deepali Jain, Ujjawal Soni, Gaurav Kumar Gupta, and Palak Agarwal
Pacific-Asia Conference on Knowledge Discovery and Data Mining, pp. 144-155. Springer, Cham, 2017
- **Creator Aware and Diverse Recommendations of Digital Content**
Natwar Modani, Deepali Jain, Ujjawal Soni, Gaurav Kumar Gupta, and Palak Agarwal
US Patent Application 15/598,193. Filed on 16 June 2017
- **Personalized Creator Recommendations**
Natwar Modani, Deepali Jain, Ujjawal Soni, Gaurav Kumar Gupta, and Palak Agarwal
US Patent Application 15/625,237. Filed on 17 May 2017

RESEARCH PROJECTS

- **Accelerated Convergence in LSTM through Temporal Difference Loss** Jul - Aug 2017
 1. Proposed modification of conventional loss function of an LSTM model for a supervised sequence classification task by using a weighted combination of binary cross-entropy and TD(0) error.
 2. The model with the modified loss function was shown to converge much faster with no drop in accuracy.
 3. Tested the model on the task of purchase prediction from online navigation sequence of users on an e-Commerce Website.
- **Measurement of Users' Experience on Online Platforms from their Behavior Logs** Ongoing
 1. Modeled users' behaviour on an online platform environment using an LSTM network and proposed Markov Decision Process as a framework for measuring experience as a latent variable in this environment
 2. Implemented a data-driven approach that computes experience by fixed point iteration method.

¹Equal contribution by first two authors.

3. Evaluation of the models provides evidence that estimated values are relevant metrics of experience. The proposed approach can overcome deficiencies of traditional survey methods for experience measurement.
- **An LSTM Based System for Prediction of Human Activities with Duration** *Apr - Aug 2017*
 1. Proposed an LSTM-based deep learning solution for the the problem of human activity prediction. Given a sequence of past activities and their duration, the system estimates the probabilities for future activities and their duration.
 2. Designed a human activity data collection experiment and created an android app for the same.
 3. Developed a probabilistic sequence matching method and implemented a sequence alignment algorithm inspired from gene and protein sequence mining research as comparison baselines.
 4. Demonstrated the ability of LSTM networks to detect long term correlations in activity data.
 5. Implemented and compared methods of sequence generation from LSTM for modeling complete days.
 - **An Auction Based Mechanism for Recommending Items in a Two-Sided Platform** *Ongoing*
 1. Proposed an auction based mechanism for content-owners to be able to influence the system about whom to expose their creations to in a multi-stakeholder recommendation setting.
 2. Supervised a team of interns for implementing a simulation of an online auction system for recommendation of content from 650 creators to 1500 viewers.
 3. Designed and carried out experiments to show that while, as one can expect, the relevance of the recommendations to the viewers reduces slightly, our system is able to achieve the objectives of the content-owners significantly better.
 - **Emotion Detection from Sensor Data of Wearable Devices** *Ongoing*
 1. Conducted a field experiment to test the hypothesis that human emotions can be detected from heart-beat signals from a wearable fitness device.
 2. Implemented an LSTM sequence classification model for recognition of emotion.
 - **Representation of Marketing Domain Knowledge** *Ongoing*
 1. Created a prototype to represent textual knowledge from Marketing literature in the form of a knowledge graph and draw first-order inference on it in Prolog for a question-answering application.
 2. Compared existing memory-augmented and attentive deep neural network architectures for the task of question answering from text.
 - **Fairness Aware Recommendations on Behance** *Jul - Oct 2016*
 1. A re-ranking strategy was proposed that can be applied to the scored recommendation lists to improve exposure distribution across the content creators on two-sided platforms (thereby improving the fairness), without unduly affecting the relevance of recommendations provided to the consumers.
 2. Implemented a scalable spark app for item similarity based collaborative filtering algorithm. Also implemented a greedy optimization based reranking algorithm for making the collaborative filtering based recommendations fair and diverse.
 - **Blind Source Separation of Audio Signals** *Jan - May 2016*
 1. Conducted a comparative study of the existing solutions to the Blind Source Separation (Cocktail Party) problem. The accuracy as well as efficiency results obtained from same experiments on different methods were documented.
 2. Trained an LSTM recurrent neural network on a long dataset of different speech signals convolutively mixed with various sounds. The system is capable of extracting simple mono-frequency signals from the mixture.

OTHER PROJECTS

- **Human-Computer Interface using Electroencephalography Signal Classification** *Aug - Nov 2015*
Recorded EEG signals were pre-processed through Common Spatial Pattern filter and a binary SVM classification model was trained on the samples to predict motor imagery classes (left/right hand movement).
- **Context-Aware Media Content Analysis** *May - Jul 2015*
Built an end-to-end physical activity recognition system based on accelerometer data from mobile sensors. Tested the hypothesis that different context of readers leads to different choice of media articles, using click-stream data analysis.
- **Adler: Text Classification API based on TechTC-300 Test Collection** *Feb - Apr 2016*
Developed a ready-to-use text corpus generation engine as an open source python package. The final dataset used chi-squared feature selection and TF-IDF feature weighting. Classification of text into various topics based on extracted features was performed using a Decision-Jungle classifier in AzureML Studio.

- Bond Clustering and Risk Stripe Prediction** Oct 2015
 GSQuantify 2015 Data Science Challenge National Finalist Entry. Implemented a supervised classification model for predicting the correct trading Risk Stripe for different corporate bonds given their properties after dimensionality reduction, feature selection and comparison of many statistical models for best performance.
- Declutter: OneDrive Plugin to Automatically Organize Documents** Oct 2015
 Code.Fun.Do. 2015 Winning Entry from IIT Roorkee. Built a plugin for MS OneDrive to tag documents in a folder based on content and also organize them into categorized subfolders. AzureML based text-categorization API was developed and used to tag content.
- Raphael: Classification of Paintings based on Style and Era** Apr - May 2015
 Artificial Neural Networks Course Project under Prof. G.N. Pillai. Built a system to classify paintings taken from wikiart.com into the era and style they belong to, using low level (color histograms, texture, color saturation) and high level (SIFT descriptors) image features. An ensemble of SVM, Feed-forward Neural Networks and Random Forests were used for classification.
- Forsit: Recommendation Engine for Mathematical Problem Solving Website** Aug 2015
 Built a recommendation engine for a mathematical problem solving platform developed by SDS Labs using content based recommendations and collaborative filtering.
- Xavier: Knowledge Representation of PDF Document Content** Sep 2015
 Built a python module for extracting structured information from a set of PDF documents. The documents were scraped and their content was parsed to extract the document structure as the first step. Then, important entities and relations between them were identified with the help of structure information and NLP.
- Book Management Software for Wikibooks** May - Aug 2014
 Google Summer of Code Worked on a PHP and Javascript based project under Wikimedia organization with the goal of developing BookManager extension for Mediawiki software in Wikibooks and Wikisource. Created a robust and user-friendly interface for editing, reading, navigation and migration of large Wikibooks (~ 10,000 sections).

RELEVANT COURSEWORK

Undergraduate: Artificial Neural Networks, Graph Theory, Mathematical Modeling, Digital Signal Processing

Independent: Reinforcement Learning (Udacity), Probabilistic Graphical Models (Coursera), Game Theory (Coursera), Introduction to Machine Learning (Coursera), Deep Learning (Udacity), Knowledge-Based AI: Cognitive Systems (Udacity)

TECHNICAL SKILLS

Machine Learning: TensorFlow, Keras, Spark, Python Scipy stack, R, Theano, Torch, Caffe, GNU Octave, MATLAB

Development: PHP, Python: (Django, Flask), JS: (ReactJS, NodeJS), Ruby, MySQL

Programming Languages: C++, Python, Java

Misc.: Bash, Git, Android, \LaTeX

POSITIONS OF RESPONSIBILITY

- Developer, SDS Labs, IIT Roorkee** 2013 - 2016
- Coordinator, Programming and Algorithms Group, IIT Roorkee** 2014
- Chief Web Coordinator, Watch Out News Agency, IIT Roorkee** 2014

REFERENCES

- Dr. P. Anandan** CEO, Wadhvani Institute of Artificial Intelligence
- Dr. Atanu R. Sinha** Principal Scientist, Adobe Research
- Dr. G.N. Pillai** Professor, IIT Roorkee