

Mittul Singh

Personal Information

Tweet at: [@MittulSingh](#)

Languages Known: English, German (Goethe Level A2), Hindi

Date of birth: 15.01.1987

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Nationality: Indian

Research Interests

Language Modelling (LM), Speech Recognition, Deep Learning, Machine Learning, Low-Resource Languages

Professional Experience

Postdoctoral Researcher at Speech Recognition Group, Aalto University, Finland [Apr. 2018 - Present]

- Modeling rare-word accurate RNNLM approximation for first-pass decoding
- Unsupervised training of acoustic models for low-resource languages

Postdoctoral Researcher at Spoken Language Systems Group, Saarland University, Germany [Aug. 2017 - Mar. 2018]

- Develop LM adaptation techniques for Speech Assistant for airline traffic controllers
- Develop automatic schemes to re-train Speech systems with newly transcribed data

Director and Technology Strategist at Inventra Technologies Pvt. Ltd., Greater Noida, India [Oct. 2013 - Mar. 2016]

- Designed and developed an activity based social network, namely PopIT, managing a team of three people
- Developed a recommendation system to suggest activities to users and communities

Industrial Internship at Amazon Development Center India Pvt. Ltd., Bengaluru, India [May, 2008 – July, 2008]

- Developed **aggregation framework for Amazon's Ad service records** using Apache's Hadoop
- Designed the user interface to display meaningful metrics using Struts 2.0 engine and YUI
- **Simplified data organization**, enabled **better maintenance** of the large number of service records

Education

Ph.D student at [Spoken Language Systems Group \(LSV\)](#), Saarland University, Germany [Oct. 2011 - Jul. 2017]

Advisor: Prof. Dr. Dietrich Klakow

Funded by Saarland University, BABEL Project, Metalogue Project

Integrated Master of Technology in Mathematics and Computing [Aug. 2005 - July 2010]

at Indian Institute of Technology, Delhi (IIT Delhi), India

CGPA - 7.82/10

Funded by India's HRD Ministry

Selected Publications

- **Mittul Singh**, Arunav Mishra, Youssef Oualil, Klaus Berberich, Dietrich Klakow. *Long-Span Language Models for Query-focused Unsupervised Extractive Text Summarization*. ECIR 2018
- **Mittul Singh**, Youssef Oualil, Dietrich Klakow. *Approximated and Domain-Adapted LSTM Language Models for first-pass decoding in speech recognition*. INTERSPEECH 2017
- **Mittul Singh**, Clayton Greenberg, Youssef Oualil, Dietrich Klakow. *Sub-Word Similarity based Search for Embeddings: Inducing Rare-Word Embeddings for Word Similarity Tasks and Language Modelling*. COLING 2016
- **Mittul Singh**, Clayton Greenberg, Dietrich Klakow. *The Custom Decay Language Model for Long Range Dependencies*. TSD 2016
- **Mittul Singh**, Dietrich Klakow. *Comparing RNNS And Log-linear Interpolation Of Improved Skip-model on four BABEL Languages: Cantonese, Pashto, Tagalog, Turkish*. ICASSP 2013

Projects

Grammar-Induced Classes in Language Model Adaptation for Air Traffic Control Speech Recognition

Research Project at LSV

[Aug. 2017 - Oct. 2017]

- Induced word classes from standard phraseology used by Air Traffic Controllers for issuing commands to pilots
- Integrated the word classes into language model (LM) adaptation framework to reduce data sparsity
- Integrated and Adapted LMs improved the command error rates over the an n -gram based baseline by 28%

Language Modeling for Spoken Term Detection task on BABEL languages

Research Project at RADICAL Team, BABEL

[Sep. 2012 - June 2014]

- **Improved performance of Skip n-gram based LMs** in comparison to RNN based LM on BABEL languages: Cantonese, Pashto, Tagalog and Turkish. [published at ICASSP 2013]
- Implemented Term/Keyword specific LMs and applied fast marginal adaptation LMs to enhance lattice recall of the spoken term detection task on Turkish and Tagalog
- Applied character based LMs based on morphological properties of Tamil and Zulu to improve keyword detection

Managing and extending in-house language modelling toolkit for LSV and [IDeaL](#)

Development Project at LSV and IDeaL

[Oct. 2011 - Mar. 2018]

- Managed and extended c++ and python enabled language modelling toolkit for the **IDeaL** project
- Implemented new language modelling techniques and provided support to new users of the toolkit
- Integrated popular ARPA based language models and interfaced with other popular language modelling toolkits

Using and Smoothing Soft Clustering based Language models

Research Project at LSV

[Oct. 2011 - July 2012]

- Compared perplexities for various clustering techniques with large number of clusters on Penn Treebank dataset
- Used EM style training as Soft clustering with smoothing of the E and M steps in the algorithm
- Showed that **Soft clustering techniques encode information better than Hard clustering techniques**
- Combined with maximum likelihood estimates to obtain superior results among all the techniques

Parallelized Minimal Optimization for large datasets

Research Project at IIT Delhi

[Mar, 2010 - Aug, 2010]

- Emulated the sequential minimal optimization (SMO) method to be run on GPUs with 16 cores
- Used CUDA infrastructure to encode the Parallelized SMO on the GPU architecture
- Obtained **average speedups of 100 times** over the a SMO method run on a single core machines
- Experimented with various large datasets to obtain on par results as an SMO method

Application of Mathematical Programming to Support Vector Machines

Master Thesis at IIT Delhi, Advisor: Prof. Dr. Jayadeva

[Apr, 2009 - Apr, 2010]

- Developed Reduced Twin Support Vector Machine for Regression [published at Neurocomputing 2011]
 - Performed execution time analysis using rectangular kernels on Twin SVMs for regression
 - Extended the rectangular kernels used on SVMs to Twin SVM for regression
 - Obtained a **speedup of 3x** over large datasets with a small loss in accuracy
- Developed Non-linear Potential Proximal Support Vector Machine
 - Extended the linear Potential Proximal Support Vector Machine (LPPSVM) to a non-linear version
 - Used **kernelization** to map data to higher dimensional space and then ran LPPSVM
 - LPPSVM **advantages** of being a **fast method** enabled for linearly inseparable datasets

Automation of the PG Admission process

Development Project at IIT Delhi, Advisor: Prof. M. Balakrishna

[Aug, 2008 - Apr, 2009]

- Developed an online system to facilitate the admission of candidates for PG courses
- Implemented a web application to automate the admission process
- **Installed the system successfully** and it **received 14000 applications** for admission

Teaching Experience

- **Lecturer [June 2018]:** for master's course on **Natural Language Processing**, Lviv, Ukrainian Catholic University, Ukraine
- **Lecturer [July 2017]:** for Lviv Data Science Summer School's course **Framework for Problem Solving in Natural Language Processing**
- **Teaching Assistant [Oct. 2015 - Feb. 2016]:** for master's course on **Language Technology-1**
- **Lecturer [Oct. 2013 - Nov. 2013]:** for master's course on **Foundations of Speech and Language Technology**

Advising Experience

- **Bachelor Student** at Spoken Languages Systems Group: **Phillip Wettmann, Dominik Weber**
- **Master Student** at Spoken Languages Systems Group: **Ilyas Celik, Siwen Guo, Anu Sundar, Debjit Paul, Juan Quirós, Rajarshi Biswas**

Talks & Presentations

- **Invited talk** at MPI Informatics Deep Learning Users Group, presented my work on Long-Term Dependencies
- **Invited talk** at IDEaL Deep Learning Hackathon 2017, presented details of my work on neural network LMs
- **Research talk** at INTERSPEECH 2017, presented the accepted paper at the conference
- **Invited talk** at IDEaL PhD. Day, presented the work on inducing rare-word representations
- **Invited talk** at [IDEaL](#) language modelling user's group, presented the skip-grams and its extensions
- **Research talk** at Text, Speech and Dialogue Conference 2016, presented the accepted paper at the conference
- **Poster Presentation** at **COLING 2016 and ICASSP 2013** of the accepted papers at the respective conference

Other Professional Activities

- Attended **Scientific Writing Course** by Dr. Rose Hoberman at [MPI-SWS](#) in Summer 2016
- Attended **Soft Skills Workshops** on *Speaking and Acting with Impact*, and *Status and Professional Communication for Intro- and Extroverts* by Dr. Sylvia Löhken

Skills

Programming Languages	C++, Python
Scripting	bash, sed, awk
Operating Systems	Windows 7, Linux, MacOS
Tools & Libraries	Matlab, Keras, Tensorflow
Version Control	GIT, SVN