KUNAL CHAWLA

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EDUCATION

Indian Institute of Technology, Delhi (IIT Delhi) *July '11 - May '15*
Bachelor of Technology in Computer Science & Engineering CGPA: 8.54/10

WORK EXPERIENCE

Engineer, Visual Understanding Lab, AI Center *Mar '17 - Present*
Samsung Research, South Korea *Project Leader: Dr. Wonsik Kim*

Attention-Based Ensemble for Deep Metric Learning(ABE)

- Developed a technique to ensemble features from multiple attention-based deep learners for metric learning
- Introduced diversity loss to ensure different attention maps attend on different parts of the image
- Implemented the learners in a single network with parameter sharing to reduce runtime and memory footprint
- Achieved **state-of-the-art** retrieval results on SOP, CARS-196, CUB-200 and Inshop Clothes Retrieval Datasets
- Published paper in **ECCV 2018** and awarded Bronze Award in **Samsung Best Paper Award** 2018

Product Search for Bixby Vision

- Developed image-based product search for Bixby Vision using state-of-the-art deep metric learning approaches
- Redesigned the models for Bixby Vision data, optimised for low runtime and memory, using Caffe and Tensorflow
- Introduced a method to ensemble features from different layers in a deep network during training to enhance performance on images with partially visible objects, also improving Recall@1 on SOP from 76% (ABE) to **81%**
- Released models for 17 categories for Galaxy S8+, currently running on 100 million+ smartphones

Associate, Tizen Platform Lab, Software R&D Center *Sep '15- Feb '17*
Samsung Research, South Korea *Project Leader: Dr. Mu-Woong Lee*

Modules For Tizen Operating System

- Designed a conditional rule engine module for Internet-of-things, allowing automatic actions on defined events; and proposed a low-cost pattern recognition algorithm to find correlated events for automatic rule suggestion
- Built battery statistics module for Tizen, using information from display-on time, CPU cycles and background resources activity for per-app usage analysis, remaining battery time estimate and battery extension suggestions
- Created a Swagger Codegen module for Tizen to automatically create client SDKs from OpenAPI specification

Information Extraction for Tizen Email Client

- Developed abstractive email summarization for Tizen using discourse rules, syntactic constraints, and word graph
- Introduced an algorithm to extract contacts and calendar events information using parts-of-speech tagging

PUBLICATIONS AND PATENTS

- Kim W., Goyal B., Chawla K., Lee J., Kwon K.(2018). Attention-Based Ensemble for Deep Metric Learning: 15th European Conference, Munich, Germany, September 8-14, 2018, Proceedings, Part I. 760-777. 10.1007/978-3-030-01246-5_45.
- Methods and systems for digitizing a document, Palo Alto Research Center Inc, US Application US20160110315A1

AWARDS

Won first prize in Perfect Product Image Recognition Challenge, presented at ACMMM 2018. Designed and trained a deep metric learning model for the challenge to retrieve products for 500k+ beauty product images.

INTERNSHIPS

Research Paper Recommendation *Jun '15 - Aug '15*
***IBM Research Labs**, Delhi* *Supervisor: Dr. Mukesh Mohania*

- Designed an algorithm to recommend research papers to read based on learning aim of a reader
- Built topic dependency graph of 500+ topics, based on Wikipedia pages, paper references and textbook glossary
- Used the topic dependencies, prior knowledge and reading list of the reader for paper reading suggestions

Increasing Digitization Accuracy via Crowdsourcing *May '13 - Jul '13*
***Xerox Research Center India**, Bangalore* *Supervisor: Dr. Sailesh Vaya*

- Created a method to increase accuracy of digitization of handwritten word via crowdsourcing
- Introduced metrics for similarity of transcriptions, performance of workers and language models-based likelihood

RESEARCH PROJECTS

Editing Human Parameters in video *July '14 - Nov '14*
B.Tech. Project, IIT Delhi *Guide: Prof. Prem Kalra*

- Built a framework to edit human parameters in video like height, muscles and hair using 3D morphable models
- Trained a regression machine learning model to retouch images in all frames in response to the changed parameter
- Embedded background inpainting and **motion retargeting** on captured skeletons for consistency

Improved Graph cuts for MRF-MAP inference *Dec '14 - Jun '15*
Research & Development Project, IIT Delhi *Guide: Prof. Parag Singla*

- Improved **Generic cuts**, a message passing flow-based method for MAP inference in Markov Random Fields
- Used lifting to exploit symmetry, reducing the number of constraints and memory and computation requirements by over 50%, allowing the algorithm to scale to mid-sized (<4x5) clique potentials and non-submodular potentials

UNDERGRADUATE PROJECTS

Sentence Similarity using POS Tagging *July '14 - Nov '14*
Natural Language Processing, IIT Delhi *Guide: Prof. Mausam*

- Used weighted average of word2vec-based similarity of parts of speech for semantic sentence similarity
- Applied coreference resolution and tf-idf and phrase length based normalisation to further improve the results
- Improved binary classification accuracy from 62% to 68% compared to vector-based baseline on MSRP corpus

Online visualization and hypothesis testing *July '12 - Nov '12*
Design Practices in Computer Science, IIT Delhi *Guide: Prof. Aaditeshwar Seth*

- Visualized and clustered continuously growing social media dataset with 2500 users and 65,000+ connections
- Analyzed communication trends, underlying data distribution and statistics using statistical hypotheses testing

Developing AI players for Blackjack and Connect *Jan '14 - May '14*
Artifical Intelligence, IIT Delhi *Guide: Prof. Mausam*

- Designed and used a Markov Decision Process to model and create an optimal player for Blackjack
- Used Monte-Carlo tree search and MiniMax Algorithm to make a player for Connect 4 and its generalized versions

SCHOLASTIC ACHIEVEMENTS

- Achieved **All India Rank 6** in IIT-JEE 2011 and **All India Rank 20** in AIEEE among 1 million+ candidates
- Secured Gold Medals in **Indian National Physics** and **Indian National Chemistry Olympiad** 2011
- Certified as among the Top 1% in India, in the **Indian National Mathematics Olympiad (INMO)** 2011
- Awarded **Kishore Vigyan Protsahan Yojana** and National Talent Search scholarships by Indian Government
- Attained Competent Communicator and Leader awards in Gyodae **Toastmasters** Club with 50+ members

TECHNICAL SKILLS

- **Tools**: Caffe, PyTorch, TensorFlow, MATLAB, CUDA, CuDNN, Make, Cmake
- **Languages**: C, C++, Java, Python, Scala, Perl, Ocaml, HTML, PHP, JavaScript, CSS

RELEVANT COURSES

Machine Learning | Artificial Intelligence | Natural Language Processing | Neuro-Computing | Data Mining | Topological Spaces | Computer Graphics | Linear Algebra | Parallel Computation | Cryptography | Probability & Stochastic Processes | Discrete Mathematical Structure | Signals & Systems | Database Management | Operating Systems

TEACHING

Teaching Assistant *Jan '15 - May '15*
Artificial Intelligence, IIT Delhi *Instructor: Prof. Mausam*