Megha Nawhal

CONTACT INFORMATION

Ph.D. Student, School of Computing Science
Simon Fraser University, Burnaby, Canada

megha.nawhal10@gmail.com
https://www.sfu.ca/~mnawhal

RESEARCH INTERESTS

Machine Learning; Computer Vision: Image and video generation, Action understanding

EDUCATION

Simon Fraser University, Burnaby, Canada
Ph.D., Computing Science, 2017 - Present
Advisor: Greg Mori

Indian Institute of Technology (IIT), Kanpur, India
B.Tech. - M.Tech. (Dual Degree), Electrical Engineering, 2010 - 2015
Advisor: K S Venkatesh
Master's Dissertation: High Dynamic Range Imaging using Conventional Cameras

WORK EXPERIENCE

Google Research *May'22 - Present*
Research Intern - Perception

- Working on the problem of text-guided segment retrieval in videos.
- Exploring segment-based curriculum learning methods to model long range videos and retrieve segments relevant to a given natural language query.

Meta *Sep'21 - Feb'22*
Research Intern - Reality Labs Research

- Worked on the research problem of action anticipation for long-range egocentric activities.
- Designed transformer architectures to predict actions in an ongoing long-term activity and developed benchmarks relevant to the augmented reality scenarios.

Google Research *Apr'21 - Aug'21*
Research Intern - Perception

- Worked on the problem of scene boundary detection in videos.
- Developed a TensorFlow based framework to train audio-visual transformer models to detect semantic breaks in videos containing produced media content.

Adobe Research, San Francisco, USA *Jun'19 - Sep'19*
Research Intern - Creative Intelligence Lab

- Worked on the problem of introducing environment awareness in Augmented Reality (AR) to enhance the mobile AR experience.
- Integrated Computer Vision techniques with ARKit to process multiple sources of visual information of the overall scene of interactions with the AR device.
- Developed an AR sketching application that uses the phone bearer's pose information in 3D to address the problem of drift in AR applications.

Borealis AI, Vancouver, Canada *Oct'18 - May'19, Sep'19 - Mar'20*
Machine Learning Research Intern

- Worked on research problems in the domain of Computer Vision and Machine Learning that were published at top-tier conference venues.
- Developed novel GAN-based algorithms for zero-shot compositional generation of human-object interaction videos (published at ECCV'20).
- Designed generative flow based models to learn complex distributions of graph-structured data (published at ICML'20 Workshop).

IBM Research, Bangalore, India *Jul'15 - Jul'17*
Research Scientist - Cognitive Industry Solutions Group

- Designed effective data-driven solutions and subsequently developed their prototypes for different domains such as retail shopping, building management and smart grid leveraging data available from various opportunistic sources.
- Developed deep multi-modal representation learning models to improve the search results on fashion e-commerce portals. The proposed approaches improved customer satisfaction by 20%.
- Developed interactive systems to enhance the in-store customer shopping experience by integrating ambient intelligence technologies and Computer Vision techniques.
- Involved in a project with IBM-RESO (Real Estate Site Operations) to design algorithms for optimization of energy management in office buildings based on user consumption profiles.

Sony Corporation, Japan *May'13 - Jul'13*
Software Developer Intern - Professional Solutions Team

- Developed software modules for Sony's imaging hardware - videocams and camcorders.
- Designed an algorithm for detection of flashband in videos, an undesirable non-uniform brightness occurring in some frames of the video. Implemented a module based on the algorithm which was included as part of the software for camcorders.
- Implemented a color corrector plugin for Vegas Pro and subsequently, executed extensive performance comparison of the developed module with other video editing tools.

Key Projects

Action Affordances for Long Term Action Anticipation *Feb'21 - Present*
Collaboration: Akash Abdu Jyothi, Greg Mori (Simon Fraser University) [webpage]

In this paper, we design a two-stage learning approach to enable generic reasoning using individual short snippets across activity videos in addition to the temporal context provided by the input video. We develop a novel transformer architecture that receives a video as input and predicts a set of action instances as output. This work is to be presented at ECCV'22.

Activity Graph Transformers for Temporal Action Localization *Apr'20 - Nov'20*
Collaboration: Greg Mori (Simon Fraser University) [webpage]

In this project, we proposed a novel end-to-end learnable encoder-decoder transformer model for the task of temporal action localization in untrimmed human activity videos. Our approach aims to model the non-linear temporal structure in such videos by reasoning over the videos as graphs using graph self-attention mechanisms.

Generating Videos of Zero-Shot Compositions of Actions and Objects *Oct'18 - Dec'19*
Collaboration: Leonid Sigal, Greg Mori, Andreas Lehrmann (Borealis AI) [webpage] [paper]

In this work, we introduced the task of generating human-object interaction videos in a zero-shot compositional setting. To generate human-object interaction videos, we proposed a novel adversarial framework focusing on different aspects of a video such as pixel level information and object-centric scene graphs derived from videos. This work was presented at ECCV'20.

Continuous Graph Flow *Mar'19 - Dec'19*
Collaboration: Greg Mori, Lili Meng, Zhiwei Deng (Borealis AI) [webpage] [paper]

In this paper, we presented a generative flow based model that generalizes the neural message passing in graphs to continuous time. We employed an neural ordinary differential equation involving shared and reusable functions to model interactions in the graph structured data. We validated the model for a diverse set of generation tasks across different domains: graph generation, image puzzle generation, and layout generation for scene graph. This work was presented at ICML'20 Workshop on Graph Representation Learning and Beyond.

Learning Disentangled Multimodal Representations *Jan'16 - Jul'17*
Collaboration: Vikas Raykar, Mitesh Khapra, Amrita Saha (IBM Research) [paper]

In this work, we extensively evaluated the feasibility of using joint multimodal representations for the task of searching for apparel and accessories on fashion e-commerce portals. We proposed novel variations of correlational autoencoder based model for learning joint multimodal representations for multimodal end applications: cross-modal image retrieval, visual search, and image tagging. This work was presented at WACV '18.

Improved Scene Capture in Unfavourable Lighting Conditions *Jan'14 - Jun'15*
Collaboration: K S Venkatesh, Saumik Bhattacharya (IIT Kanpur) [paper]

In this work, we designed imaging solutions to recover the scene information lost due to unfavorable lighting conditions and produce a better quality image. We developed a solution that employs camera gain as the controlling parameter to manipulate the final image of the scene being captured in order to minimize saturation (underexposure and overexposure) in the output. The proposed solution enables easy integration of this feature with the currently available imaging hardware by a simple firmware update. This work was presented at ICIP '17.

PUBLICATIONS

- M. Nawhal, A.A Jyothi, G. Mori, *Rethinking Learning Approaches for Long Term Action Anticipation*. In: Proceedings of European Conference on Computer Vision (ECCV), 2022.
- M. Nawhal, M. Zhai, A. Lehrmann, L. Sigal, G. Mori, *Generating Videos of Zero-Shot Compositions of Actions and Objects*. In: Proceedings of European Conference on Computer Vision (ECCV), 2020.
- M. Zhai, L. Chen, J. He, M. Nawhal, F. Tung, G. Mori, *Piggyback GAN: Efficient Lifelong Learning for Image Conditioned Generation*. In: Proceedings of European Conference on Computer Vision (ECCV), 2020.
- Z. Deng, M. Nawhal, L. Meng, G. Mori, *Continuous Graph Flow*. In: Proceedings of International Conference on Machine Learning (ICML) Workshop on Graph Representation Learning and Beyond, 2020.
- M. Zhai, L. Chen, F.Tung, J. He, M. Nawhal, G. Mori, *Lifelong GAN: Continual Learning for Conditional Image Generation*. In: Proceedings of International Conference on Computer Vision (ICCV), 2019.
- Y. Gong, H. Hajimirsadeghi, J. He, M. Nawhal, T. Durand, G. Mori, *Variational Selective Autoencoder*. In: Proceedings of Symposium on Advances in Approximate Bayesian Inference (AABI), 2019.
- M. Nawhal, J. Lang, G. Mori, P. Chilana, *VideoWhiz: Milestone-Driven Overviews for Non-Linear Navigation of Visually-Rich Instructional Videos*. In: Proceeding of Graphics Interface (GI), 2019.
- A. Saha, M. Nawhal, M. Khapra, V. Raykar, *Learning Disentangled Multimodal Representations for the Fashion Domain*. In: Proceedings of IEEE Winter Conference on Applications of Computer Vision (WACV), 2018.
- M. Jain, M. Nawhal, S. Dechu, S. Dupatti, *MobiCeil: Cost-free Indoor Localizer for Office Buildings*. In: Proceedings of ACM International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI), 2018.
- M. Nawhal, S. Bhattacharya, K. S. Venkatesh, *Improved Scene Capture in Unfavourable Lighting Conditions*. In: Proceedings of IEEE International Conference on Image Processing (ICIP), 2017.
- M. Nawhal, H. Bansal, et al. *Unlocking the Hidden Potential of Data Towards Efficient Buildings: Findings from a Pilot Study in India*. In: Proceedings of IEEE PES Innovative Smart Grid Technologies (ISGT), Europe, 2016.
- K. Saurav, H. Bansal, M. Nawhal, V. Chandan, V. Arya, R. Sridhar, B. Ramesh, *Optimizing Energy Costs of Commercial Buildings in Developing Countries*. In: Proceedings of ACM International Conference on Future Energy Systems (e-Energy), 2016

Patents Granted/Filed

- Y. Gong, J. He, T. Durand, M. Nawhal, Y. Cao, G. Mori, H. Hajimirsadeghi, *System and method for machine learning architecture for partially-observed multimodal data,* 2020.
- M. Nawhal, M. Zhai, G. Mori, A. Lehrmann, *System and method for generation of unseen composite data objects,* 2020.
- M. Nawhal, A. Prakash, P. Kumar, M. Jain, A. Singhee, G. Sharma, A. Shah, *Transforming Jewelry Shopping Experience: Combining Real and Virtual Worlds,* 2017.
- M. Nawhal, M. Jain, S. Dupatti, S. Dechu, *MobiCeil: Indoor Location Detection using Ceiling Patterns,* 2015.
- M. Nawhal, S. Bhattacharya, K. S. Venkatesh, *Gain Swept HDR Imaging,* 2015.
- M. Nawhal, S. Bhattacharya, K. S. Venkatesh, *Colour Filter Array and Process for Real Time Foreground Extraction,* 2015.
- M. Nawhal, B. Narasimhachari, S. Bhattacharya, K. S. Venkatesh, *Controlled Neutral Density Filter for HDRI,* 2014.

Awards

- Recipient of the Graduate Dean's Entrance Scholarship at Simon Fraser University (awarded to one student each year).
- Awarded Manager's Choice Award as an appreciation of the work at IBM Research in 2015.
- Recipient of Eaton Pratibha Excellence Award 2015 (awarded to 6 women engineers each year at national level (India) for their research contributions).
- National level finalist of Microsoft Imagine Cup (Software Design Challenge), 2012 along with only 6 other teams for designing an innovative handsfree user interface for the disadvantaged.
- Won 1^{st} prize in IBM Technical Web Contest, 2011 for paper on the development of low latency, inexpensive eye-mouse.

Miscellaneous Initiatives

- Serving as a reviewer for AI venues: TPAMI, CVPR, NeurIPS, WACV and BMVC since 2017.
- Project Mentor at Invent the Future 2018, two week summer enrichment camp aimed at providing Grade 11 girls the opportunity to explore the world of Artificial Intelligence through team projects and industry field trips.
- Coordinator of Media and Publicity Cell at Anataragni 2012 & Techkriti 2011, inter-collegiate cultural festival and technology fest of IIT Kanpur respectively.