Jaskirat Singh | Academic CV

☐ (+61) - 0411417934 • ✉ jaskirat.singh@anu.edu.au
🌐 1jsingh.github.io • 🅖 Jaskirat Singh

Research Interests

Controllable Image Synthesis and Editing, Creative Content Generation, Reinforcement Learning

Education

The Australian National University — **Expected**
Ph.D. in Computer Science — *Sep' 21–Present*
Supervisors: Prof. Liang Zheng and Prof. Stephen Gould

The Australian National University — **GPA: 7/7**
Master of Machine Learning and Computer Vision — *Jul' 19–Jul' 21*
🎓Awarded University Medal for Exceptional Academic Excellence

Indian Institute of Technology, Delhi — **GPA: 9.3/10**
Bachelor of Technology (B.Tech), Electrical Engineering — *2013–2017*
Specialization in Intelligent and Cognitive systems

Publications

1. Paint2Pix: Interactive Painting based Progressive Image Synthesis and Editing
   Jaskirat Singh, Liang Zheng, Cameron Smith, and Jose Echevarria. *2022*
   ECCV 2022

2. Intelli-Paint: Towards Developing Human-like Painting Agents
   Jaskirat Singh, Cameron Smith, Jose Echevarria, and Liang Zheng. *2022*
   ECCV 2022, US Research Patent

3. Combining Semantic Guidance and Deep Reinforcement Learning For Generating Human-Level Paintings
   Jaskirat Singh, and Liang Zheng. *2021*
   CVPR 2021

4. Sparse Attention Guided Dynamic Value Estimation for Single-Task Multi-Scene Reinforcement Learning
   Jaskirat Singh, and Liang Zheng. *2021*
   arXiv 2021

Research/Teaching Experience

Adobe Research — **San Jose, California**
Research Intern: Computer Vision, Imaging & Video — *Jun' 21 – Dec' 21*

The Australian National University — **Canberra**
Research Scholar: Computer Vision Lab with Prof. Liang Zheng — *Dec' 20 – Feb' 21*

The Australian National University — **Canberra**
Teaching Assistant: Introduction to Machine Learning (COMP6670) — *Jul' 20 – Nov' 20*

Yahoo Japan — **Tokyo**
Machine Learning Research Engineer — *Oct' 17– Sept '18*

Honors and Achievements

- **Awarded University Medal** for exceptional academic excellence at the Australian National University.

- **Awarded Chancellors Letter of Commendation** at the Australian National University.

- Awarded **ANU Computer Science Summer Research Grant** ($5k).

- **Invited for delivering a tutorial** on "Applying deep reinforcement learning for computer vision research" by the **Australian Centre for Robotic Vision (ACRV)** group.

- Our project "Connected Stories of Australia" has been awarded as the **best innovative design project** by the **National Museum of Australia**.

- **Won national hackday at Yahoo Japan**, among 54 competing teams from all across Japan, for developing a real-time application for **facial attribute modification using reversible GANs**.

- Received **IIT Delhi Merit Award & Scholarship** for outstanding academic performance.

- Secured **All India Rank 128 in IIT-JEE** among 1.4 million aspirants appearing for the exam.

- Won the **Silver Medal at National FIDE Rated Chess Tournament.**

Other Research Projects

Domain-Aware Adversarial Level Selection for Multi-Scene RL
Supervisor: Prof. Liang Zheng *Jul' 20–Nov' 20*

- Developed an adversarial level selection strategy for achieving **better sample complexity and episode rewards** on multi-scene environments like OpenAI ProcGen and AI2THOR based visual navigation task.

- **Reduced the source to domain gap** by using a perpetual RL model for minimizing the KL divergence between sample distributions for the training and validation game level trajectories.

Exploring Semantic and Depth Penalties for Sketch Generation
Research Project with Dr. Dylan Campbell *Jul' 20–Nov' 20*

- Used model-based RL with a depth variance penalty to **enhance depth perception** in generated sketches.
- Designed a semantic entropy reward function to discourage strokes traversing multiple object boundaries.

Connected Stories of Australia: Project with National Museum of Australia
Supervisor: Prof. Emmaline Lear *Jul' 19–Nov' 19*

- Developed a machine learning and design thinking based solution for improving organisation of historic artifacts within NMA's database and increase the outreach of their public API.

- The final prototype poses as an online interactive treasure hunt, with an NLP based backend for learning sparse concept associations.

Finetuning CNNs using Neural Activation Data
Independent Study: IIT Delhi *Jul' 16–Jun '17 & Jan' 19–May' 19*

- Demonstrated significant correlation between **representational dissimilarity matrices (RDM)** for **IT cortex activations** and higher-order CNN features.

- Showed the importance of inter-class correlations between model features for popular CNN architectures.

- **Improved the linear SVM accuracy** for penultimate layer features from the Squeezenet model by **9.86 %** on the Cadieu dataset using a novel RDM loss finetuning approach.

Face Detection and Recognition
Undergraduate Thesis: IIT Delhi *Jul' 16–May' 17*

- Proposed a novel face recognition approach which uses **Spatial Transformer Networks** along with traditional Facenet pipeline in order to introduce translational and rotational invariance for input images. This resulted in an **improvement of 1.37%** in accuracy over the Facenet model.
- Came up with a unique approach to **combine 3D facial reconstruction and face recognition** in an end to end pipeline, in order to account for the variations in 3D structure and facial pose.

Relevant Courses

- Advanced Topics in Machine Learning (Convex & Differentiable Optimization) Class rank: 1
- Statistical Machine Learning (Bayesian Neural Networks) Class rank: 1
- Advanced Topics in Computer Vision (Probabilistic Graphical Models) Class rank: 1
- Advanced Topics in Mechatronics (Computer Vision and Deep Learning)

Technical Skills

- **Programming Languages and Tools:** Python, Java, C++, LaTeX
- **Deep Learning Frameworks:** Pytorch, Tensorflow, Caffe, Caffe2
- **Big Data:** Hadoop, Hive, SQL, Teradata
- **Web Development:** HTML5, CSS, Javascript