KARUSH SURI

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RESEARCH INTERESTS

Karush is a graduate student at the University of Toronto completing his M.A.Sc in Electrical and Computer Engineering. His research focuses on developing novel intelligent agents for hierarchical reinforcement learning, model-based reinforcement learning and planning for robotic control.

EDUCATION

University of Toronto   2019 - Present
Master of Applied Science   *Toronto, Canada*

· Thesis: Deep Hierarchical Reinforcement Learning
· Advisors: Prof. Yuri A. Lawryshyn & Prof. Konstantinos N. Plataniotis
· GPA: 3.93/4

Amity University   2015 - 2019
Bachelor of Technology   *Delhi, India*

· Thesis: Application of Deep Learning & Game Theory for Sign Language Recognition using Wearable Sensors (link)
· Advisor: Prof. Rinki Gupta
· GPA: 8.78/10

SCHOLARSHIPS & AWARDS

University of Toronto, Canada
Edward S. Rogers Graduate Scholarship   *2019-2021*

Amity University, India
Best in Technical Innovation Award (class of 2015-2019)   *2019*
Most Frugal Innovation Award   *2018*
100% Curriculum Merit Scholarship   *2015*

Others
Young Achievers Award   *2015*

RESEARCH APPOINTMENTS

RBC Capital Markets   2019 - Present
Thesis Researcher   *Toronto, Canada*

· Developed Hierarchical Reinforcement Learning pipelines using A2C, DDPG and PPO for limit order bids.
· Proposed ESAC combining ES and SAC for sample efficient and scalable reinforcement learning.
· Developed and improved robotic learning algorithms for MuJoCo and DeepMind control suite continuous tasks.
· Reconstructed Evolutionary algorithms such as ES and WTA in conjunction with policy search and iterative techniques.
· Dynamic planning and control using policy gradient algorithms and off-policy Q-Learning, DQN and soft exploration techniques.

University of Toronto   2019 - Present
Graduate Research Assistant- Reinforcement Learning   *Toronto, Canada*

· Affiliated with the Center for Management of Technology & Entrepreneurship (CMTE)
· Developed Hierarchical Reinforcement Learning methods for cooperation and competition with Multi-Agent Learning using CapsNet and ConvNet.
· Implementation and improvement of policy gradient algorithms such as Deep Actor-Critic, A2C, DDPG and PPO.
· Reiteration of Episodic Q-Learning and Deep Q-Learning for exploration-based learning.

Amity University   2017 - 2019
Undergraduate Research Assistant- Deep Learning   *Delhi, India*

· Affiliated with the Signal Processing & Deep Learning Lab
· Project entitled "Indian Sign Language to Spoken Language Translator using data from Wearable Multisensor Armbands" Funded by the Department of Science and Technology, Government of India, SERB file number ECR/2016/000637.
· Constructed novel CapsNets and ConvNets for non-cooperative games, Master-Slave DNNs and LSTM-RNNs for transfer-learning and dual-stage SVMs for classification and regression tasks.

PUBLICATIONS

· *Attentive Hierarchical Reinforcement Learning for Stock Order Executions*
  preprint, 2020. (pdf) (code)
· *Continuous Sign Language Recognition from Wearable IMUs using Deep Capsule Networks and Game Theory*
  Computers And Electrical Engineering, Elsevier, Vol. 78, pp.493-503, 2019. (arXiv) (doi) (code)
· *Convolutional Neural Network Array for Sign Language Recognition using Wearable IMUs*
  5th International Conference on Signal Processing and Integrated Networks, SPIN 2019, IEEE. (arXiv) (code)
· *Transfer Learning for sEMG-based Hand Gesture Classification using Deep Learning in a Master- Slave Architecture*
  International Conference on Communication and Computational Intelligence, 2018, IEEE. (arXiv) (doi) (code)
· *Classification of Hand Gestures from Wearable IMUs using Deep Neural Network*
  2nd International Conference on Inventive Communication and Computational Technologies, 2018, IEEE. (arXiv) (doi) (code)
· *Activity Detection from Wearable Electromyogram Sensors using Hidden Markov Model*
  2nd International Conference on Computing Methodologies and Communication, 2018, IEEE. (arXiv) (doi) (code)

TEACHING APPOINTMENTS

· *Computer Organization*   (Winter 2019)
  CSC258H, University of Toronto, Canada.
· *Integral Calculus*   (Fall 2016)
  MATH, Sai Kripa Orphanage.
· *Numerical Differentiation*   (Fall 2016)
  MATH, Sai Kripa Orphanage.
· *Introduction to Physics*   (Fall 2016)
  PHY, Sai Kripa Orphanage.

INDUSTRY EXPERIENCE

EdAuthority
Content Management Intern- Data Science
2019-2020
Delhi, India

· Drafted, Edited and Published articles on modern-day trends and advancements in Data Science.
· Backend Website management and development of marketing solutions for digital platform and end-to-end marketing.

Airtel
Network Management Intern
2018
Delhi, India

· Project entitled "Fundamentals of Network Communication".
· conducted Fault Management and Throughput Handling by being an active part of the Radio Network Team.

Reliance Jio
Summer Engineering Intern
2017
Delhi, India

· Project entitled "Excel Data Processing Automator using Python Programming".
· Devised novel automated algorithms for creation, updating and deletion of spreadsheets consisting of Throughput and Connectivity Loss data.
· Received Letter of Recommendation from Mr. Hemant Jha (General Manager) for excellent innovation during the project.

Sony
Summer Engineering Intern
2016
Delhi, India

· Project entitled "LCD Television Systems and BRAVIA Engine Applications".
· conducted circuit assessment and analysis of BRAVIA engine Television sets along with their maintenance.

SELECTED PROJECTS

TradeR: Trade Execution using Reinforcement Learning
Reinforcement Learning
2020
RBC Capital Markets

· Hierarchical Reinforcement Learning agent capable of trading on stock orders using a customized buy-sell simulator
· Trading operations using variable policies and multi-agent framework
· TradeR has tradd over 70 stocks from the S&P 500 index at 1 minute intervals for the 2019-2020 fiscal year.

Evolution-based Soft Actor-Critic for Scalable Reinforcement Learning
Reinforcement Learning
2020
RBC Capital Markets

· Proposed ESAC combining ES and SAC for sample efficient and scalable reinforcement learning
· Developed and improved robotic learning algorithms for MuJoCo and DeepMind control suite continuous tasks.

Attentive Hierarchcial Reinforcement Learning for Stock Order Executions
Reinforcement Learning
2020
University of Toronto

· S&P 500 stock order execution pipeline utilizing Hierarchical Reinforcement Learning and Attention for high frequency trading.
· Developed and tested on a total of 6 tickers with 2 minute granularity during the COVID-19 outbreak.

InvestApp: Investing Made Easy

Data Science

2020

University of Toronto

· Worked in a team of 4+ members to develop a real-time investment application connecting 7+ countries for project funding via seed finance, joint ventures and fund managers.
· Actively conducted sessions, developed financial models, augmented business macroprocesses and proposed pitch solutions for tackling transaction regulations and making offshore trade feasible.

Faceboard: Real-Time Image Generation from Deep Generative Models

Deep Learning

2019

University of Toronto

· REST API capable of reconstructing images in real-time from CAEs and GANs deployed on serverless Lambda and scheduled for background runs using Eventbridge.

Continuous Sign Language Recognition from Wearable IMUs using Deep Capsule Networks and Game Theory

Deep Learning

2019

Amity University

· Construction of 1D Capsule Networks for sign language recognition and their comparison with CNNs using real-time non-cooperative winner-take-it-all games.

An EMP Jamming Robotic System using Arduino Programming

Robotics

2018

Amity University

· Mobile robot capable of jamming 2.4GHz signals using circular patch antenna.
· Won the award for Most Frugal Innovation at the Annual Poster Presentation and Technical Competition (APPTeC 2018)

ORGANIZATIONAL WORK & SERVICES

Elevate

Event Volunteer

2019

Toronto, Canada

· Event Volunteer at the Elevate Toronto Tech Festival.
· Worked in a team of 10+ members to manage and assist industry professionals at the Meridian Hall.

Graduate Management Consulting Association

Member

2019

Toronto, Canada

· Student member of the GMCA for 4 months (December, 2019 - March, 2020).
· Engaged and collaborated in management consulting events with focus on professional development and business networking.

IEEE Signal Processing & Integrated Networks (SPIN)

Lead Organizer

2017-2019

Delhi, India

· Head of the stage team at 6th SPIN.
· Member of the coordinating committee at 5th SPIN.
· Member of the volunteering committee at 4th SPIN.

CERTIFICATIONS

· Big Data (IBM), (link)   2019.
· Customer Analytics (Wharton Business School), (link)   2019.
· Machine Learning (Stanford University), (link)   2017.