# SEENIVASAN LALITHKUMAR

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in lalithkumar-seenivasan

Nationality: Singapore

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#### **EDUCATION**

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#### Doctor of Philosophy (PhD), Biomedical Engineering

- **2019 Ongoing**
- National University of Singapore
- Scene understanding in robotic surgery semantic segmentation, surgical scene graph, surgical action and phase recognition.
- Natural language processing in robotic Surgery surgical visual question answering and surgical scene captioning.
- Key publications: Published 3 papers in MICCAI and 3 papers (2 concurrently accepted in IEEE RA-L Journal) in IEEE ICRA Conference.
- Served as reviewer for MICCAI, IEEE TMI, IEEE ICRA, DART-MICCAI & IEEE-Sensors.

### B.Eng. (Hons) Electrical Engineering

- **2016 2019**
- National University of Singapore
- Design Centric Programme: Our team worked on a novel tendon-driven actuation mechanism that enabled the miniaturization (diameter: 2 – 3 mm) of surgical tools, allowing its deployment through a single-port flexible manipulator (diameter: 8 - 12 mm).
- Exchange Student at Tampere University of Technology, Finland.

#### Diploma in Mechatronics

- **2010 2013**
- ▼ Temasek Polytechnic, Singapore
- Major Project (TechX Challange): Designed and developed 3D simulations of the robot and challenge environments using the ROS and Gazebo simulator, enabling the software team to test the navigation and sensor processing algorithms.
- Diploma plus in Life Sciences Fundamentals.

#### **PUBLICATIONS**

# Top Highlights

- Seenivasan, L., Islam, M., Kannan, G., & Ren, H. (2023). Surgicalgpt: End-to-end language-vision gpt for visual question answering in surgery. In Accepted in: International Conference on Medical Image Computing and Computer-Assisted Intervention.
- Pang, W., Islam, M., Mitheran, S., Seenivasan, L., Xu, M., & Ren, H. (2022). Rethinking feature extraction: Gradient-based localized feature extraction for end-to-end surgical downstream tasks. IEEE Robotics and Automation Letters & ICRA2023, 7(4), 12623-12630.
- Seenivasan, L., Islam, M., Krishna, A. K., & Ren, H. (2022). Surgicalvqa: Visual question answering in surgical scenes using transformer. In International Conference on Medical Image Computing and Computer-Assisted Intervention (pp. 33–43). Springer.
- Seenivasan, L., Mitheran, S., Islam, M., & Ren, H. (2022). Globalreasoned multi-task learning model for surgical scene understanding. IEEE Robotics and Automation Letters & ICRA2022, 7(2), 3858-3865.

#### **AWARDS**

#### **National University of Singapore**

- Outstanding Undergraduate Researcher Prize AY2017/2018
- FoE 32nd INNOVATION & RESEARCH AWARD (2018)

#### Temasek Polytechnic, Singapore

- Singapore Manufacturing Federation Metal, Machinery & Engineering Industry Group Project Prize 2013
- Commendation Award for Major Project 2013
- CCA Merit Award in Leadership 2013
- Director's List Award 2013
- Director's List Award 2012

# National Service, Singapore Police

- Commander's Outstanding Performance Award 2015
- Sword Of Merit, Police Officer Cadet Course 2014

#### WORK EXPERIENCE

# Research Engineer The Chinese University of Hong Kong

# Research Engineer **National University of Singapore**

- Dec 2020 Feb 2023 Singapore
- Manage and lead projects with research interns

### **Engineering Manager Aitech Robotics And Automation Pte Ltd**

- Lead and manage the R&D dept
- · Technical adviser & Design overall system architecture

## Software Engineer (Part-time), R&D Dept

#### **Aitech Robotics And Automation Pte Ltd**

**i** Jun 2016 - Jul 2019 **■** Singapore

### Associate Engineer, R&D Dept **Aitech Robotics And Automation Pte Ltd**

**i** Jan 2016 - Jun 2016 **○** Singapore

- Islam, M., Seenivasan, L., Ren, H., & Glocker, B. (2021). Class-distribution-aware calibration for long-tailed visual recognition. *UDL Workshop, International Conference on Machine Learning*.
- Islam, M., Seenivasan, L., Ming, L. C., & Ren, H. (2020). Learning and reasoning with the graph structure representation in robotic surgery. In *International Conference on Medical Image Computing and Computer-Assisted Intervention* (pp. 627–636). Springer.

# **Extended List**

- Bai, L., Islam, M., Seenivasan, L., & Ren, H. (2023). Surgical-vqla: Transformer with gated vision-language embedding for visual question localized-answering in robotic surgery. *arXiv preprint arXiv:2305.11692*.
- Islam, M., Seenivasan, L., Sharan, S., Viekash, V., Gupta, B., Glocker, B., & Ren, H. (2023). Paced-curriculum distillation with prediction and label uncertainty for image segmentation. *International Journal of Computer Assisted Radiology and Surgery*, 1–9.
- Seenivasan, L., Islam, M., Xu, M., Lim, C. M., & Ren, H. (2023).
   Task-aware asynchronous multi-task model with class incremental contrastive learning for surgical scene understanding. *International Journal of Computer Assisted Radiology and Surgery*, 1–8.
- Seenivasan, L., Islam, M., Ng, C.-F., Lim, C. M., & Ren, H. (2022).
   Biomimetic incremental domain generalization with a graph network for surgical scene understanding. *Biomimetics*, 7(2), 68.
- Lal, R., Swaminathan, R., Seenivasan, L., Qiu, L., & Ren, H. (2021).
   Scoopnet: 6dof pose estimation pipeline for origami-inspired worm robots. In 2021 ieee International Conference on Development and Learning (ICDL) (pp. 1–6). IEEE.
- Xu, M., Seenivasan, L., Yeo, L. L. L., & Ren, H. (2020). Stent deployment detection using radio frequency-based sensor and convolutional neural networks. Advanced Intelligent Systems, 2(10), 2000092.
- Ren, H., Chen, C. X., Cai, C., Ramachandra, K., & Lalithkumar, S. (2017). Pilot study and design conceptualization for a slim single-port surgical manipulator with spring backbones and catheter-size channels. In 2017 ieee International Conference on Information and Automation (ICIA) (pp. 499–504). IEEE.

# **Book Chapters Highlights**

Lalithkumar, S., Cai, X., Ramachandra, K., Wong, F., & Ren, H. (2020). Tendon routing and anchoring for cable-driven single-port surgical manipulators with spring backbones and luminal constraints. Flexible Robotics in Medicine: A Design Journey of Motion Generation Mechanisms and Biorobotic System Development, 169.

# **Challenges**

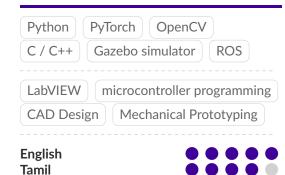
- Huaulmé, A., Harada, K., Nguyen, Q.-M., Park, B., Hong, S., Choi, M.-K., ... Dou, Q., et al. (2023). Peg transfer workflow recognition challenge report: Do multimodal data improve recognition? Computer Methods and Programs in Biomedicine, 107561.
- Nwoye, C. I., Alapatt, D., Yu, T., Vardazaryan, A., Xia, F., Zhao, Z., ... Wang, H., et al. (2023). Cholectriplet2021: A benchmark challenge for surgical action triplet recognition. *Medical Image Analysis*, 86, 102803.

- Develop robotic solutions in the Robot Operating System (ROS)
- Develop autonomous navigation stack (robot localization, navigation and obstacle avoidance)

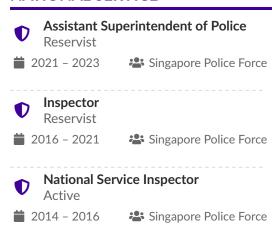
# Temp Technical Support Officer Temasek Polytechnic

- Involved in a research project in developing an indoor micro-aerial vehicle with autonomous navigation features without the aid of GPS

#### **SKILLS**



#### NATIONAL SERVICE



#### **LEADERSHIP**

# Vice-Captain, Touch Rugby

**=** 2018 − 2019 **=** NUS Raffles Hall

# Captain, Touch Rugby

**■** 2017 - 2018 **■** NUS Raffles Hall

# Quartermaster, Temasek Polytechnic International Students Group

苗 2012 - 2013 🏻 🏛 Temasek Polytechnic

#### **CO-CURRICULAR**

Touch Rugby Softball Photography
International Students Group Scouts