

# Adam Purnomo

Master's Student, 2<sup>nd</sup> year

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🐙 [github.com/AdamPurnomo](https://github.com/AdamPurnomo)

## EDUCATION

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### Tohoku University

*Master of Engineering in Robotics*

Sendai, Japan

Oct. 2020 – Sep. 2022

### Tohoku University

*Bachelor of Engineering in Mechanical and Aerospace Engineering*

Sendai, Japan

Oct. 2016 – Sep. 2020

## HONORS AND AWARDS

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### Tohoku university president's award

March 2021

An award given to students with outstanding academic performance during 4 years of undergraduate study.

### Sato-Yo international scholarship

Oct. 2020 – Sep. 2022

A fully-funded scholarship for 2 years period of graduate study provided by Sato-Yo International Scholarship Foundation (SISF).

### Entrance exam exemption for M.Eng, Department of Robotics, Tohoku University

March 2020

Written test exemption given if GPA during undergraduate study exceeds a certain threshold.

### Monbukagakusho scholarship

Oct. 2016 – Sep. 2020

A fully-funded scholarship for 4 years period of undergraduate study provided by Japan's Ministry of Education, Culture, Sports, Science and Technology.

## RESEARCH EXPERIENCE

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### Sparse Identification of Lagrangian for Dynamical Systems

Dec. 2020 – Present

*Tohoku University*

*Advisor : Mitsuhiro Hayashibe*

- Proposed a method to extract Lagrangian from noisy measurement data
- Formulated the problem of Lagrangian identification into a learning-based framework
- Investigated robust optimization methods for sparse solutions
- Conducted simulations of four ideal nonlinear dynamical systems to validate the proposed method
- Improved noise robustness from previous Lagrangian identification algorithm up to 6 order of magnitude

### Deep Learning-based 6-DOF Grasp Estimation

Sep. 2019 – Sep. 2020

*Tohoku University*

*Advisor : Kazuhiro Kosuge and Shogo Arai*

- Investigated implicit 3D rotation representations of the manipulator end-effector for 6-DOF grasp estimation from depth images
- Developed a CNN-based sensing system for robust picking and 6-DOF grasp estimation in industrial bin-picking
- Conducted bin-picking experiments with four types of industrial objects
- Improved grasp success rate up to 66% from 4-DOF grasp estimation.

## RELEVANT PROJECTS

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### Mathematical Modelling for Cancer Growth | *Python*

July 2021

- Studied a model of cancer growth and propagation based on reaction-diffusion equation
- Implemented explicit finite difference method to perform cancer simulation

### C3 Robot Arm Control | *C, Linux, QNX*

March 2019 – May 2019

- Solved forward and inverse kinematics, and implemented simple path planning for a 6-DOF C3 robot arm
- Implemented Resolved Motion Rate Control for a redundant manipulator (7-DOF robot arm)

### Pen $\pi$ | *Raspberry $\pi$ , Python*

Feb. 2018 – May 2018

- Contributed to the development of a prototype pen which converts handwriting to latex code with MEMS sensors
- Implemented Kalman Filter and quaternion transformation for raw data processing

### Simple Car Navigation System | *C, OpenGL*

Dec. 2017 – Jan. 2018

- Implemented Dijkstra's Algorithm for shortest path search
- Developed GUI based car navigation system built on top of C using OpenGL packages

## RESEARCH REPORT

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### Manuscript Submitted

- A. Purnomo and M. Hayashibe, "Sparse Identification of Lagrangian for Nonlinear Dynamical Systems via Proximal Gradient Method."
- S. Arai, F. Zhuang, F. Tokuda, A. Purnomo, Y. Xu, K. Kosuge, "Deep Learning-based Fast Grasp Planning for Robotic Bin-picking by Small Data Set without GPU."

### Manuscript in Preparation

- A. Purnomo, S. Arai, F. Tokuda, K. Kosuge, "Deep Learning-based 6-DOF Grasp Estimation for Industrial Bin-Picking."

### Presentation

- A. Purnomo, S. Arai, F. Tokuda, K. Kosuge, "Deep Learning-based Grasp Detection," in the 21st Society of Instrument and Control Engineers System Integration Division (SICE SI) Conference, 2020

## OTHERS

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### Research Interests

Dynamical Systems, Data-driven Modeling, Control Theory, Mathematical Modeling, Optimization, Nonlinear Control, Learning-based Control, Computer Vision, Deep Learning, State Estimation.

### Programming Languages

Python, C/C++, Java, Matlab, LaTeX.

### Software and Libraries

Tensorflow, Pytorch, Scipy, Sympy, ROS, OpenCV, Bullet, Blender, Solidworks, NxLib.

### Languages Proficiency

Indonesian (Native), English (Full professional proficiency), Japanese (limited working proficiency).