

# Savyaraj R. DESHMUKH

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Nationality: Indian  
Age: 22 years (05 Nov, 1997)



## Education

### Master in Robotics

*EPFL, École Polytechnique Fédérale de Lausanne*

**GPA: 5.39/6**

*2019-Present*

### BTech in Mechanical Engineering with Honours

*Indian Institute of Technology, Bombay*

**GPA: 8.91/10**

*2015-2019*

(Minor in Physics)

## Research Interests

- Robotics
- Nonlinear Dynamics
- Control Theory
- Computational Neuroscience

## Key Projects

### Neural controller design and analysis tools for locomotion

*Biorobotics Laboratory / Semester project*

**EPFL**

*Sep'19 - Jan'20*

- Designed populations of biological neuron models using Neural Engineering Framework and formulated the relevant encoding-decoding schemes to represent a given control system
- Demonstrated the framework through lamprey locomotion using a chain of locally coupled oscillator networks (Central Pattern Generators)
- Studied bifurcation analysis tools such as numerical continuation for nonlinear dynamical systems
- Analyzed half center oscillator - a prominent rhythm generation mechanism for locomotion using numerical continuation and characterized its dynamical regimes

### Modeling and Control of 2 Dimensional Aerial Robots

*Undergraduate thesis*

**IIT Bombay**

*Aug'18 - May'19*

- Simulated a 2D version of quadcopter in MATLAB and developed controllers for Hovering and Trajectory Tracking using a cascade PID structure
- Used A\* graph search algorithm to generate motion primitives based trajectories in cluttered environments with obstacles in 2D space
- Implemented heuristic trajectory refinement which significantly reduced the computational efforts for generating smooth trajectories
- Integrated path planning with the controller to verify its performance

## Nonlinear Rubber Isolator Dynamics

*Acoustics and Dynamics Laboratory / Summer internship*

**Ohio State University**

*May'18 - Jul'18*

- Worked on nonlinear model of rubber isolator and extended by adding a clearance element
- Analyzed significant parameters and studied effect of individual nonlinearities on the system and their interactions
- Quantified the amount of nonlinearity by introducing a new parameter in the frequency domain which calculates the differences in Power Spectral Densities
- Investigated new behaviors observed to incorporate recent experimental findings such as multiple steady states and chaos

## Diversity Induced Resonance

*Nonlinear Dynamics Laboratory*

**IIT Bombay**

*May'17 - May'19*

- Extended above idea from continuous systems to discrete system of globally coupled logistic maps
- Studied effects of parameter values and coupling strength at different diversity values and investigated new phenomena observed, for instance, multiple resonances
- Formulated a mean field reduced model for the system and performed bifurcation analysis which accurately predicted the behavior observed in previous simulations
- Analyzed robustness of the phenomenon by limiting the extent of interactions to a local coupling

## Technical Skills

**Languages** Python, MATLAB, C++

**Tools** GitHub, ROS, ANSYS Fluent, SolidWorks, AutoCAD,  $\LaTeX$

## Positions of Responsibilities

### Co-ordinator, Mood Indigo

*Asia's largest college cultural festival*

**IIT Bombay**

*May'16 - Dec'16*

- Associated with "Informals" team of Mood Indigo, IIT Bombay
- Assisted in Idealization and Conceptualization of over 20 events in Mood Indigo 2016
- Worked with a team of 6 Coordinators and 20+ organizers to conduct 5 events in 2016 edition

## Scholastic Achievements

- Awarded a certificate of merit for securing an All India Rank top 1%  
in the National Standard Examination in Chemistry 2015
- Secured All India Rank 404 in JEE Advanced among 120 thousand students 2015
- Secured top 99.81 percentile in JEE Mains among 1.35 million students 2015

## Key Courses

**Control Theory** Model Predictive Control, Legged Robots, Networked Control Systems, Geometric and Analytical Aspects of Optimal Control

**Computer Science** Applied Machine Learning, Foundations of Intelligent and Learning Agents, High Performance Scientific Computing

**Physics** Classical Mechanics, Statistical Physics, Nonlinear Dynamics and Chaos, Quantum Mechanics I, Quantum Mechanics II, Elementary Particle Physics