Lei He

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RESEARCH INTERESTS

Navigation and Control System Design for Unmanned Aerial Vehicle
Deep Reinforcement Learning for Robotics
Explainable Artificial Intelligence
Bio-inspired Computer Vision

EDUCATION

- **Ph.D. in Aircraft Design: Northwestern Polytechnical University (NWPU), China**
  Sep 2015 - Aug 2023

  School of Aeronautics
  Overall GPA 82/100, ranking 12th of 26
  Direct Ph.D. project without a master's degree
  Supervised by Prof. Bifeng Song (The Changjiang Scholar award)
  Ph.D. Thesis: Autonomous Obstacle Avoidance Flight of Bird-like Flapping Wing Micro Aerial Vehicle based on Deep Reinforcement Learning

- **Visiting Ph.D. student: Cranfield University, UK** ***Feb 2019 - Dec 2020***

  School of Aerospace, Transport and Manufacturing
  Supported by China Scholarship Council. (No. 201806290175)

- **B.Eng. in Aircraft Design: Northwestern Polytechnical University (NWPU), China**
  Sep 2011 - Jun 2015

  Honors College, overall GPA 86/100, ranking 20th of 76

REASEARCH EXPERIECNE

- **Robotics, Autonomy and Machine Intelligence (RAMI) Group**
  City, University of London ***Apr 2020 - Dec 2020***
  Orbital AI-based Autonomous Refuelling (OIBAR) project
  Supported by European Space Agency (ESA)
  Working as a research assistant (part-time) for AI-based target detection and docking mechanism design
  Supervised by Prof. Nabil Aouf

- **NWPU Micro Vehicle Research Lab** ***Sep 2014 - Aug 2023***

  Modelling and control system design for bio-inspired flapping wing aerial vehicles
  Light-weight Vision-based obstacle avoidance system design
  Vertical Take-off and Landing (VTOL) UAVs design and control
  Supervised by Prof. Bifeng Song

- **Dynamics, Simulation & Control Group, Cranfield University** ***Feb 2019 - Dec 2020***

  Deep reinforcement learning based visual navigation and collision avoidance
  Explainable deep reinforcement learning for UAV path planning
  Supervised by Prof. Nabil Aouf and Dr. James F. Whidborne

- **Shaanxi Province Key Lab of Speech & Image Information Processing (SAIIP)**
  May 2014 - Aug 2014

  Audio, speech and language processing using machine learning
  Supervised by Prof. Lei Xie

- **NWPU Intelligent Car Lab** ***Aug 2013 - Mar 2015***

  Automatic driving and tracking system for intelligent car using computer vision
  Supported by China National Innovation Experiment Program for college students
  Supervised by Prof. Shiru Qu

PUBLICATIONS (https://scholar.google.com/citations?user=QGwYalkAAAAJ&hl=zh-CN)

- **Lei He**, Aouf Nabil, and Bifeng Song. Explainable Deep Reinforcement Learning for UAV Autonomous Navigation. **Aerospace science and technology 2021**
- **Lei He**, Nabil Aouf, James Whidborne, Bifeng Song, Integrated moment-based LGMD and deep reinforcement learning for UAV obstacle avoidance. **ICRA 2020**.
- **Lei He,** Duarte Rondao, Nabil Aouf. A Novel Mechanism for Orbital AI-based Autonomous Refuelling. **AIAA SCITECH 2023 Forum**
- **Lei He**, Nabil Aouf, James Whidborne, Bifeng Song, Deep Reinforcement Learning based Local Planner for UAV Obstacle Avoidance using Demonstration Data. **preprint 2020**
- Changhao Chen, Bifeng Song, Shuhui Bu, **Lei He**. An improved point feature-based sparse stereo vision. **IET Image Processing 2022**
- Shi Qian Liu, James F Whidborne, **Lei He**. Backstepping sliding-mode control of stratospheric airships using disturbance-observer. **Advances in Space Research 2021**
- Siqi Wang, Bifeng Song, **Lei He**, Xinyu Lang. Modeling and robust attitude controller design of a distributed propulsion tilt-wing UAV in hovering flight. **CCDC 2019**
- Siqi Wang, Bifeng Song, **Lei He**. Robust attitude control system design for a distributed propulsion tilt-wing uav in flight state transition. **APISAT 2018**
- Bifeng Song, **Lei He**, Chen Wang, Wenqing Yang, A multi power fusion flight control system applied to micro UAV. ZL 2015 1 0990837.X **（China Patent 2015）**

INTERN/EXCHANGE EXPERIENCE

- **Sanyi UAS Co. Ltd, Xi'an, Shaanxi, China** ***Aug 2016 - Dec 2018***

  Assistant flight control engineer
  Participate in design and flight test of several industrial UAVs

- **National Taiwan University of Science and Technology, Taipei, Taiwan**
  Aug 2013 - Jan 2014

  Exchange student in Department of Computer Science and Information Engineering
  Major in Computer Science and Software Engineering

HONORS / AWARDS

First Class Scholarship of NWPU ***2012, 2013, 2014***
First prize of NWPU Intelligent Car Competition ***2012***
Second prize of the Freescale National College Students' Intelligent Car Competition ***2012***
Excellent achievements of National Innovation Experiment Program for college students ***2015***

SKILLS

- **UAV control system design, simulation and real flight test**
  Python, C++, MATLAB, Simulink
  PX4 open-source flight stack development
  ROS and Linux programming
  UAV operation for 8 years (including fixed-wing, flapping-wing, quadrotor and VTOL)
- **Deep reinforcement learning**
  TensorFlow, PyTorch

HOBBIES

Sports, aviation spot and photography

REFEREES

- **Professor Bifeng Song**
  School of Aeronautics, Northwestern Polytechnical University
  Phone: +86 186 9180 9317 Email: sbf@nwpu.edu.cn
- **Professor Nabil Aouf**
  School of Science & Technology, City, university of London
  Phone: +44 (0)20 7040 5168 Email: nabil.aouf@city.ac.uk
- **Professor James Whidborne**
  Centre for Aeronautics, Cranfield University
  Phone: +44 (0) 1234 754787 Email: j.f.whidborne@cranfield.ac.uk