Zhicong Sun

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EDUCATION

- Southern University of Science and Technology (SUSTech) Sept 2020 - Jun 2023 (Expected)

M.E. in the Department of Computer Science and Engineering
Supervisors: Prof. Shuang-Hua Yang, Prof. Yulong Ding
GPA: 3.2/4. Core Courses: Intelligent data analysis, Advanced Artificial Intelligence, Advanced Algorithms, Evolutionary Computation, Research Skills.

- Harbin Institute of Technology (HIT) Sept 2016 - Jun 2020

B.Eng. in the Department of Communication Engineering
Supervisor: Prof. Changjun Yu
GPA: 80.08/100. **Top 10 Influential Graduates**. Core Courses: Principles of Communications, Computer Communication Network, Analog Electronics, Digital Electronics, Random Signal Analysis, Digital Signal Process, Multimedia Communication, Mobile communication, , Switching Technology, Embedded System Design.

PUBLICATIONS

1. **Zhicong Sun**, Yulong Ding, Shuang-Hua Yang. Contradictions Identification of Safety and Security Requirements for Industrial Cyber-Physical Systems. *IEEE Internet of Things Journal, Under Review.*

2. **Zhicong Sun**, Yulong Ding, Shuang-Hua Yang. Joint Safety and Security Risk Analysis in Industrial Cyber-Physical Systems: A Survey. *IEEE Internet of Things Journal, Under Review.*

RESEARCH EXPERIENCE

1. Dealing with Security and Safety (S&S) Contradictions for Industrial Cyber-Physical Systems
Main Researcher | SUSTech, Advisor: Prof. Shuang-Hua Yang Sept 2021 - Present

- Goal: to propose a systematic methodology for identifying the contradictions in S&S requirements and provide strategies to reduce such contradictions.
- Contributions: (i) an iCPSs conceptual model for is proposed and some widely recognized S&S objectives are adopted and redefined to constrain the objects and interactions in the model; (ii) a causes-phenomena-effects analysis (CPEA) method is proposed to unify the elicitation of S&S requirements; (iii) a requirement template with constricted natural language patterns is designed for expressing both safety and security requirements; (iv) the concept of contradictions in S&S requirements is defined, and two sufficient conditions that result in contradictions are proposed; further, algorithms are provided to judge whether these conditions are satisfied or not.
- Academic achievement: finished a 21-page paper which is under review by **IEEE IoT-J**.
- Application achievement: this work has been recognized by Huawei Trustworthy Intelligent Systems Laboratory and the SUSTech academic council, and it will be used in **Huawei's self-driving automobile**.
- Future directions: to propose a methodology for reducing S&S contradictions.

2. Joint Safety and Security Risk Analysis in Industrial Cyber-Physical Systems (iCPSs)

Main Researcher | SUSTech, Advisor: Prof. Shuang-Hua Yang Sept 2021 - Present

- Goal: to identify the limitations in the field of joint safety and security risk analysis, so as to provide research directions in future work.
- Contributions: (i) made a more detailed classification of four kinds of interactions between safety and security (i.e., independence, conditional dependence, mutual reinforcement, and antagonism) and maps relevant methods to these relationships; (ii) focused on the methodologies for safety and security joint risk analysis and discussed their advantages and shortcomings; (iii) proposed twelve criteria to evaluate reviewed approaches and made a preliminary discussion about whether these methods meet the requirements of iCPS.
- Academic achievement: proposed six research directions; finished a 24-page review article that is under review by **IEEE IoT-J**.
- One of the future directions: to propose a data-driven risk assessment method that does not use subjective experience for initial modeling and can meet the dynamic configuration characteristics of the system.

3. Direction Estimation of Ionospheric Echo based on High-Frequency Ground Wave Radar

Main Researcher | HIT, Advisor: Prof. Changjun Yu Jan 2020 - May 2020

- Goal: to estimate the azimuth and elevation of ionospheric echo, so as to provide a basis for the suppression of ionospheric clutter in future work.
- Contributions: (i) identified the best array parameters and criteria for digital beamforming; (ii) improved the convergence performance of adaptive weight vector adjustment algorithm; (iii) reduced the time complexity of the algorithm for beam-scanning-based angle measurement from $O(n^2)$ to $O(n)$.
- Achievements: got 95 points in the graduation project review, ranking second in my major; appraised as an **excellent graduation design of the HIT**.

4. Part of Project Experiences

- Using visualisation/human-computer interaction/data analysis to overcome limitations of safety and security risk analysis (to be started soon, co-research with Zezheng Feng).
- Simple Covariance Matrix Self-Adaptation Evolution Strategy with Repelling Subpopulations
- Optimization of the initialization of item grouping under the BIGO model
- Optimization of the convergence speed and the local search ability of the IFEP algorithm
- Electronic Control of Robots in Robomaster (China University Robot Competition)

AWARDS

- Second Prize in Preliminary Contest of Business Plan of the 15th China Graduate Electronic Design Contest, 2020 (Leader).
- Second Prize in the South China Division of the 15th China Graduate Electronic Design Contest, 2020 (Deputy leader).
- Second Prize in the Final Tournament of the 18th RoboMaster University Championship, China University Robot Competition, 2019 (Leader).
- Grand Prize (Second Place) in the North China Division of the 18th Robomaster University Technical Challenge, 2019 (Leader).
- First Prize in the Northern Division of the 18th RoboMaster University Championship, China University Robot Competition, 2019 (Leader).
- Participation Award in ICRA RoboMaster AI Challenge, 2019 (Member).
- Grand Prize (First Place) in the 7th China Marine Vehicle Design and Construction Contest, 2018 (Leader).
- Third Prize in the University Student Science and Technology Innovation Competition, Shandong,

2018 (Deputy leader)..

- Third Prize in the Northern Division of the 17th RoboMaster University Championship, China University Robot Competition, 2018 (Leader).
- First Prize in the HITwh Internal Contest of the Shandong Science and Technology Innovation Competition, 2018 (Deputy leader).
- Second Prize in the 1st HITwh Headmaster Cup Science and Technology Contest, 2018 (Leader).
- First Prize of the HITwh Artificial Intelligence and Intelligent Hardware Contest, 2018 (Leader).

HONORS

- **Top 10 Influential Graduates**, 2020.
- Outstanding Scientific and Technological Innovation Individual of the School of Information Science and Engineering, 2019.
- Science and Technology Innovation Scholarship, 2019, 2018, 2017.
- Outstanding Communist Party Member of the School of Information Science and Engineering, 2018.
- Excellent Volunteer, 2018.
- Social Work Scholarship, 2017.
- Sports Excellence Scholarship, 2017.

TEACHING EXPERIENCE

CS324 Internet of Things | *Teaching Assistant* 2022 Spring

LANGUAGES & SKILLS

- Languages: Chinese (native), English (fluent).
- Programming: Python, Matlab, C/C++, Java.
- Others: Machine Learning, Evolutionary Computation, Embedded System Development (ARM, FPGA, FreeRTOS, RT-Thread), Robot Operating System.

INTERNSHIP EXPERIENCES

- **Standard Robots, Co., Ltd |** Electronic Control Group Jul 2020 - Aug 2020
- **ZTE Corporation |** Wireless Communication Group Jan 2020 - Feb 2020

LEADERSHIP

- **HIT Robot Contest Team (HRCT) |** *Vice Captain* Aug 2017 - Aug 2019
- **HIT Maker Space |** *Head* Sept 2017 - Feb 2018