

# HE Xujie (何旭杰)

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## Personal Information

Gender: Male

Date of Birth: Apr 1996

Nationality: Chinese

Hometown: Tianshui, Gansu, China

## Education

- |                     |                                |  |        |                       |
|---------------------|--------------------------------|--|--------|-----------------------|
| • 2021.09 – 2025.09 | Harbin Institute of Technology | Control Science and Engineering                        | PhD    | Supervisor: Jin Jing  |
| • 2018.09 – 2021.03 | Harbin Engineering University  | Control Science and Engineering                        | M.Eng. | Supervisor: Zhang Wen |
| • 2014.09 – 2018.06 | Shenyang Aerospace University  | Measurement and Control Technology and Instrumentation | B.Eng. |                       |

## Research Areas

**Vision Multimodal Foundation Models; Industrial Visual Defect Detection; Ship Semantic Segmentation; Multi-Ship Video Object Tracking**

## Publications

- [1] **Xujie He**, Jing Jin\*, Duo Chen, Cangtian Zhou. A robust defect detection method with a generalization enhancer and cross-modality aggregator for cylinder bores [J]. Engineering Applications of Artificial Intelligence 136 (2024): 109058. **(JCR-Q1, IF=7.5)**
- [2] **Xujie He**, Jing Jin\*, Duo Chen, Yiyuan Feng, He, Xujie, et al. An integrated defect detection method based on context encoder and perception-enhanced aggregation for cylinder bores [J]. Journal of Manufacturing Processes 114 (2024): 196-212. **(JCR-Q1, IF=6.2)**
- [3] **Xujie He**, Jing Jin\*, Fujiang Yu, She Zhao, Duo Chen, Xiang Gao. MSIDetector: Detecting Multi-Scenario industrial defects using an adapted visual foundation model and dual thresholding discriminator [J]. Measurement, Volume 242, Part A (2025): 115753. **(JCR-Q1, IF=5.2)**
- [4] **Xujie He**, Jing Jin\*, Yu Jiang, Dandan Li. A lightweight convolutional neural network-based feature extractor for visible images [J]. Computer Vision and Image Understanding (2024). **(JCR-Q1, IF=4.3)**
- [5] Wen Zhang, **Xujie He\***, Wanyi Li, Zhi Zhang, Yongkang Luo, Li Su, Peng Wang. A robust deep affinity network for multiple ship tracking [J]. IEEE Transactions on Instrumentation and Measurement 70 (2021): 1-20. **(JCR-Q1, IF=5.6)**
- [6] Wen Zhang, **Xujie He\***, Wanyi Li, Zhi Zhang, Yongkang Luo, Li Su, Peng Wang. An integrated ship segmentation method based on discriminator and extractor [J]. Image and Vision Computing 93 (2020): 103824. **(JCR-Q1, IF=4.2)**
- [7] **Xujie He**, Jing Jin\*, Duo Chen, Cangtian Zhou, Jiale Jiang and Yuhan Chen. RoMATer: An end-to-end robust multi-aircraft tracker with transformer [C]. 2024 International Joint Conference on Neural Networks (IJCNN). IEEE (2024). **(EI)**
- [8] Duo Chen, Jin Jing\*, **He Xujie**, Liu Yi, Guo Yanan, and Ni Yanshu. Aggregated Data Augmentation for Defects Using Enhanced Diffusion Models and Poisson Blending. 2025 37th Chinese Control and Decision Conference (CCDC), pp. 607-614. IEEE (2025). **(EI)**

## Patents

- [1] An Image Classification Method Based on a High-Accuracy and Lightweight Feature Extraction Network Model [P]. ZL202210843597.0, 2025-11-25. **(Granted; 1st inventor).**
- [2] A Vision-Based High-Accuracy Defect Detection Method for the Inner Wall of Automotive Engine Cylinder Bores [P]. ZL202310562059.9, 2025-09-12. **(Granted; 2nd inventor; Supervisor is 1st inventor).**
- [3] A Highly Generalizable Defect Detection Method for the Inner Wall of Automotive Camshaft Mounting Holes [P]. CN202311766600.4, 2023-12-21. **(Filed; 2nd inventor; Supervisor is 1st inventor).**
- [4] A Visible-Light-Image-Based Multi-Aircraft Tracking Method and System [P]. CN202211633089.6, 2022-12-19. **(Filed; 2nd inventor; Supervisor is 1st inventor).**
- [5] A Ship Segmentation Method Under Sea – Sky Background Based on Joint Image Information [P]. ZL201911388248.9, 2022-06-17. **(Granted; 2nd inventor; Supervisor is 1st inventor).**
- [6] A Multi-Ship Tracking Method Using Multi-Dimensional Fusion [P]. ZL202010333573.1, 2022-07-15. **(Granted; 2nd inventor; Supervisor is 1st inventor).**
- [7] An Improved Automotive Engine Cylinder-Bore Inner-Wall Detection Method Combining YOLOv5 and Knowledge Distillation [P]. CN202311544930.9, 2023-11-20. **(Filed; 3rd inventor).**

- [8] A High-Accuracy and Fast Steering-Wheel Surface Defect Detection Method [P]. CN202311780096.3, 2023-12-22. **(Filed; 3rd inventor).**

## Research Projects Involved

- **Quality Inspection System for Enclosed/Sealed Areas Based on Multi-Object Feature Recognition**

**Type: Innovation Fund Project**

**Focus: Defect and Foreign Object Debris (FOD) detection in sealed multi-compartment aircraft areas**

To address incomplete inspections in enclosed aircraft areas and the presence of surface defects and FOD, we developed a feature-recognition-based vision inspection system for automated qualification checks. The non-contact system delivers high-precision, high-throughput inspection, improving accuracy while reducing false alarms and labor cost. Production-line validation demonstrates improved assembly quality and manufacturing efficiency.

- **AI-Based Defect Inspection System for Automotive Steering Wheels**

**Type: University – Industry Joint R&D Project**

**Focus: Defect detection on steering-wheel wrapping surfaces**

Based on machine vision and deep learning, we developed a tailored optical imaging setup, inspection algorithms, and an automation module to enable online defect inspection of steering-wheel surfaces (Area A/B and inner Surface C). The system detects defects such as scars, tendons/veins, burn marks, and dents/impacts, and automatically tags and stores part-related information to support quality management, traceability, status monitoring, and statistical reporting. Mark the inaugural year of artificial intelligence for the listed company *Joyson* electronics.

- **Vision-Based Defect Inspection Imaging System and Software Tools for Complex Industrial Parts**

**Type: Heilongjiang Provincial “Jiebang Guashuai” Key Technology R&D Program**

**Focus: Defect inspection on the inner surface of engine cylinder bores**

Based on machine vision and deep learning, we developed a dedicated optical imaging system, detection algorithms, and an automation module for real-time online inspection of engine cylinder bores. The system detects scratches, cracks, and pitting, and automatically tags and stores part information for quality management and traceability. Our self-developed equipment was officially included in the first batch of the Ministry of Industry and Information Technology (MIIT) Innovative Product Catalog for Intelligent Inspection Equipment, and it won the First Prize in the provincial “Intelligent Audio-Visual” special competition.

- **Intelligent Maritime Situation Perception System**

**Type: MIIT High-Tech Ship R&D Project**

**Focus: Ship semantic segmentation**

To address the accuracy degradation of ship semantic segmentation under sea – sky background conditions, we proposed a ship segmentation method that jointly leverages multi-source image cues. By modeling the sea – sky background characteristics and designing scene-aware segmentation strategies, the proposed approach improves segmentation performance across diverse maritime scenarios.

- **Key Technologies and System Development for Autonomous Coastal Navigation**

**Type: National Key R&D Program of the Ministry of Science and Technology (MOST), China**

**Focus: Fusion-based maritime dynamic multi-target tracking**

To mitigate the limitations of detection-based multi-object tracking methods — namely their heavy reliance on detector performance — and to address accuracy degradation caused by challenging sea – sky backgrounds, we proposed a multi-ship tracking approach based on multi-dimensional fusion. By jointly exploiting information from three dimensions (scale, detection regions, and motion), the method improves overall tracking accuracy and robustness.

## Awards

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|--|--|
| ● “CCB Cup” China International College Students’ Innovation Competition (2025) — Silver Award   | ● National Encouragement Scholarship (2014, 2015, 2016 Academic Years) |
| ● National Scholarship for PhD Students (2024)   | ● Outstanding Student Award (University Level)                         |
| ● National Scholarship for Master’s Students (2020)  | ● Outstanding Student Model Award (University Level)                   |
| ● Harbin Institute of Technology “Outstanding Student (Moral Cultivation & Virtue)” Award (2024) | ● Outstanding Undergraduate Graduate                                   |
| ● First-Class Academic Scholarship (two consecutive years)                                       | ● Top 10 Campus Singers, 26th Edition — Harbin Institute of Technology |

## Self-Assessment

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- **Research :** Highly motivated and strongly problem-driven, able to distill research questions from real-world engineering challenges and address them through systematic experimental design and methodological innovation, with a strong ability to bridge theory and practical applications.
- **Work:** Strong sense of responsibility and execution, with solid communication and teamwork skills; capable of planning and driving complex projects to delivery while maintaining close attention to detail and quality.
- **Technical Skills :** Proficient in Python and deep learning frameworks (e.g., PyTorch), with hands-on experience in image processing, visual defect detection, and multi-object tracking, able to independently deliver end-to-end solutions from model design to real-world deployment.

# 何旭杰

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## 基本信息

性别: 男                      出生年月: 1996.04                      国籍: 中国                      出生地: 甘肃省天水市

## 教育背景

● 2021.09 – 2025.09	哈尔滨工业大学	控制科学与工程专业	博士	导师: 金晶
● 2018.09 – 2021.03	哈尔滨工程大学	控制科学与工程专业	硕士	导师: 张雯
● 2014.09 – 2018.06	沈阳航空航天大学	测控技术与仪器专业	学士	

## 研究方向

视觉多模态大模型、工业视觉（缺陷）检测、船舶语义分割、多船舶视频目标跟踪

## 发表论文

- [1] **Xujie He**, Jing Jin\*, Duo Chen, Cangtian Zhou. A robust defect detection method with a generalization enhancer and cross-modality aggregator for cylinder bores [J]. Engineering Applications of Artificial Intelligence 136 (2024): 109058. (中科院-工程技术 1 区-Top/JCR-Q1, IF=7.5)
- [2] **Xujie He**, Jing Jin\*, Duo Chen, Yiyuan Feng. He, Xujie, et al. An integrated defect detection method based on context encoder and perception-enhanced aggregation for cylinder bores [J]. Journal of Manufacturing Processes 114 (2024): 196-212. (中科院-工程技术 1 区-Top/JCR-Q1, IF=6.2)
- [3] **Xujie He**, Jing Jin\*, Fujiang Yu, She Zhao, Duo Chen, Xiang Gao. MSIDetector: Detecting Multi-Scenario industrial defects using an adapted visual foundation model and dual thresholding discriminator [J]. Measurement, Volume 242, Part A (2025): 115753. (中科院-工程技术 2 区-Top/JCR-Q1, IF=5.2)
- [4] **Xujie He**, Jing Jin\*, Yu Jiang, Dandan Li. A lightweight convolutional neural network-based feature extractor for visible images [J]. Computer Vision and Image Understanding (2024). (中科院-计算机科学 3 区/JCR-Q1, IF=4.3)
- [5] Wen Zhang, **Xujie He\***, Wanyi Li, Zhi Zhang, Yongkang Luo, Li Su, Peng Wang. A robust deep affinity network for multiple ship tracking [J]. IEEE Transactions on Instrumentation and Measurement 70 (2021): 1-20. (中科院-工程技术 2 区-Top/JCR-Q1, IF=5.6)
- [6] Wen Zhang, **Xujie He\***, Wanyi Li, Zhi Zhang, Yongkang Luo, Li Su, Peng Wang. An integrated ship segmentation method based on discriminator and extractor [J]. Image and Vision Computing 93 (2020): 103824. (中科院-计算机科学 2 区/JCR-Q1, IF=4.2)
- [7] **Xujie He**, Jing Jin\*, Duo Chen, Cangtian Zhou, Jiale Jiang and Yuhan Chen. RoMATer: An end-to-end robust multi-aircraft tracker with transformer [C]. 2024 International Joint Conference on Neural Networks (IJCNN). IEEE (2024). (EI 会议)
- [8] Duo Chen, Jin Jing\*, **He Xujie**, Liu Yi, Guo Yanan, and Ni Yanshu. Aggregated Data Augmentation for Defects Using Enhanced Diffusion Models and Poisson Blending. 2025 37th Chinese Control and Decision Conference (CCDC), pp. 607-614. IEEE (2025). (EI 会议)

## 授权及申请专利

- [1] **何旭杰**, 金晶, 刘一, 郭亚南. 一种基于高精度且轻量化的特征提取网络模型的图像分类方法[P]. ZL202210843597.0, 2025-11-25. (已授权)
- [2] 金晶, **何旭杰**. 一种基于视觉的高精度汽车发动机缸孔内壁缺陷检测方法[P]. ZL202310562059.9, 2025-09-12 (已授权)
- [3] 金晶, **何旭杰**, 陈铎, 冯怡园, 李鹏堂. 一种具有强泛化能力的汽车凸轮轴安装孔内壁缺陷检测方法[P]. CN202311766600.4, 2023-12-21 (申请)
- [4] 金晶, **何旭杰**, 姜宇. 基于可见光图像的多飞行器跟踪方法及系统[P]. CN202211633089.6, 2022-12-19 (申请)
- [5] 张雯, **何旭杰**, 张智, 苏丽, 宋浩, 崔浩浩, 张秋雨, 贺金秀. 一种基于联合图像信息的海天背景下船舶分割方法[P]. ZL201911388248.9, 2022-06-17 (已授权)

[6] 张雯,何旭杰,张智,苏丽,贺金秀,宋浩,崔浩浩. 一种采用多维度融合的多船舶跟踪方法[P]. ZL202010333573.1, 2022-07-15 (已授权)

[7] 金晶,陈铎,何旭杰,冯怡园. 一种改进的联合 YOLOv5 和知识蒸馏的汽车发动机缸孔内壁检测方法[P]. CN202311544930.9, 2023-11-20 (申请)

[8] 金晶,陈铎,何旭杰,姜宇,高翔. 一种高精度且快速的方向盘表面缺陷检测方法[P]. CN202311780096.3, 2023-12-22 (申请)

参与科研项目 (国家级 2 项, 企业课题 3 项)

- 基于多目标特征识别的待封闭区域质量检测系统 算法研发/学术支撑

类别 创新基金项目

研究内容 飞机多舱体封闭 区域缺陷及多余物检测

为解决飞机雷达舱闭区域标准检查不彻底、表面缺陷和多余物存在等问题, 提出基于目标特征识别的缺陷与多余物检测技术, 并开发相应合格性视觉检测系统。该系统可实现非接触、高精度、高效率的自动化检测, 提高检测精度、降低错检率, 提升质量检测集成性, 减少人力资源投入, 并通过产线示范突破人工目视检查限制, 提高飞机装配质量和生产效率。

- 汽车方向盘 AI 智能瑕疵检测系统 算法研发/学术支撑

类别 校企联合技术攻关

研究内容 方向盘包覆区域缺陷检测

基于机器视觉和深度学习技术, 通过特定设计的光学成像系统、检测算法及自动化装置, 实现方向盘 AB 以及内侧 C 面缺陷在线检测, 识别牛疤、牛筋、烙印、碰伤等缺陷, 并将部件相关信息进行自动标记、存储, 便于质量管理与回溯, 实现产品状态检测并统计。开启上市公司均胜电子的人工智能“元年”。

- 复杂工件视觉缺陷检测成像系统与软件工具研发 算法研发/学术支撑

类别 黑龙江省“揭榜挂帅”科技攻关

研究内容 发动机缸孔内壁缺陷检测

基于机器视觉和深度学习技术, 通过特定设计的光学成像系统、检测算法及自动化装置, 实现凸轮轴孔内壁的在线实时缺陷检测, 识别划伤、裂纹、砂眼等缺陷, 并将部件相关信息进行自动标记、存储, 便于质量管理与回溯。自研设备成功获批国家工信部智能检测装备创新产品目录(第一批), 获得省级《智能视听》专项赛一等奖。

- 船舶态势智能感知系统研制 算法研发/学术支撑

类别 工信部高技术船舶科研项目

研究内容 船舶语义分割方法

为了解决由于海天背景的特殊性导致的船舶语义分割算法精度降低的问题, 提出一种基于联合图像信息的海天背景下船舶分割方法, 从图像信息入手针对性的解决不同场景的船舶分割问题, 提升最终的分割精度。

- 沿海船舶自主航行关键技术与系统研发 算法研发/学术支撑

类别 科技部国家重点研发计划项目

研究内容 基于融合信息的海上动态目标跟踪

为了解决传统的基于检测主线的多目标跟踪算法过度依赖于检测器性能, 以及海天背景的特殊性导致的多目标跟踪算法精度降低的问题, 提出一种基于多维度融合的多船舶跟踪方法, 通过融合尺度、检测区域、运动三个维度的信息, 提升最终的跟踪度。

获得荣誉和奖励

- “建行杯”中国国际大学生创新大赛(2025) 银奖
- 2024 学年博士研究生国家奖学金
- 2020 学年硕士研究生国家奖学金
- 2024 年度哈尔滨工业大学“优秀学生(修身立德)”奖
- 一等学业奖学金(连续两年)
- 2014、2015、2016 学年国家励志奖学金

- 本科校三好学生、校三好学生标兵
  - 优秀本科毕业生
- 哈尔滨工业大学第 26 届校园十佳歌手

自我评价

- 在科研上：始终保持浓厚的探索热情和较强的问题意识，能够从实际工程难题中提炼科研问题，并通过系统的实验设计和方法创新加以解决，善于将理论研究与实际应用紧密结合。
- 在工作中：责任心强，执行力高，具备良好的沟通与团队协作能力，能够在复杂项目中统筹规划、推进落地，同时注重细节与质量把控。
- 专业技能方面：熟练掌握 Python、PyTorch 等深度学习框架，具备图像处理、缺陷检测与多目标跟踪的算法研发和工程部署经验，能够独立完成从模型设计到实际应用的完整流程。