



The **RoboDepth** Competition

The **1st** Challenge for
Robust Out-of-Distribution
Depth Estimation under
Common Corruptions

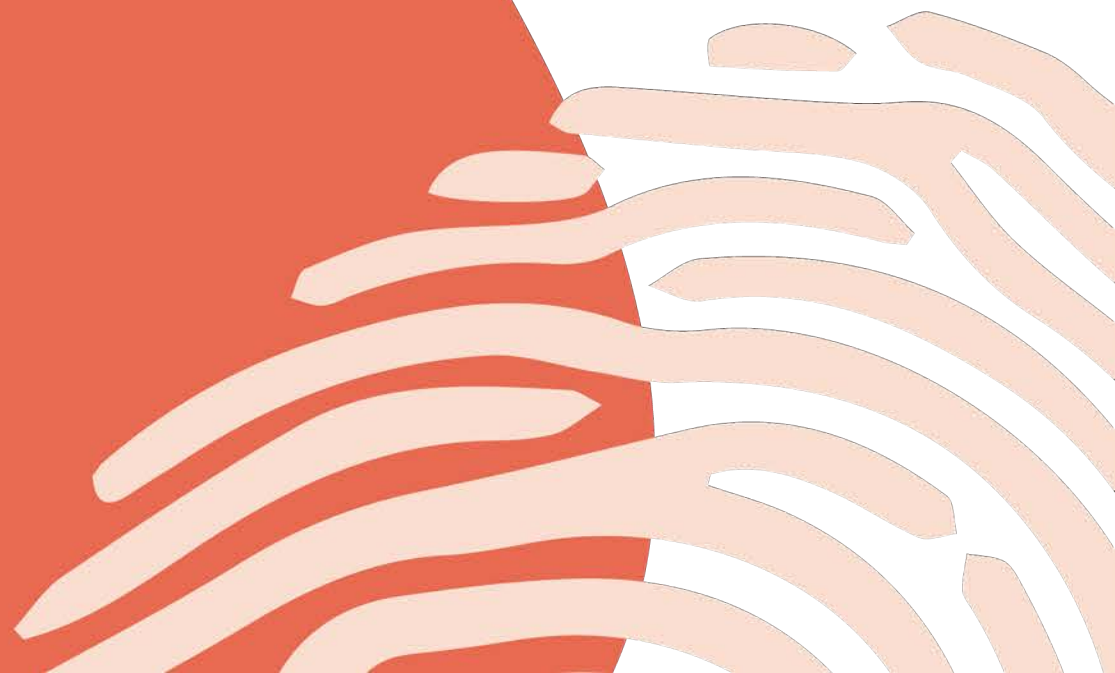


Agenda

- **Competition Overview**
- **RoboDepth Benchmark**
- **Award Ceremony**
 - Spotlight Talks (Track 1)
 - Spotlight Talks (Track 2)
- **Q & A for Organizers**



Competition Overview



RoboDepth @ ICRA 2023



DesCartes










Baidu Research

The RoboDepth Challenge

ICRA
2023

RoboDepth Organizing Team



 <p>Lingdong Kong NUS Computing lingdong@comp.nus.edu.sg</p>	 <p>Hanjiang Hu CMU, Safe AI Lab hanjianghu@cmu.edu</p>	 <p>Shaoyuan Xie HUST shaoyuanxie@hust.edu.cn</p>
 <p>Yaru Niu CMU, Safe AI Lab yarun@andrew.cmu.edu</p>	 <p>Benoit Cottureau CNRS benoit.cottureau@cnrs.fr</p>	 <p>Lai Xing Ng A*STAR, I2R ng_lai_xing@i2r.a-star.edu.sg</p>
 <p>Ding Zhao CMU, Safe AI Lab dingzhao@cmu.edu</p>	 <p>Hesheng Wang SJTU wanghesheng@sjtu.edu.cn</p>	 <p>Wei Tsang Ooi NUS Computing ooiwt@comp.nus.edu.sg</p>



Sponsors



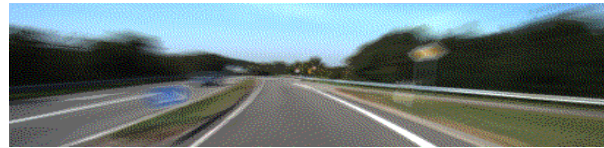
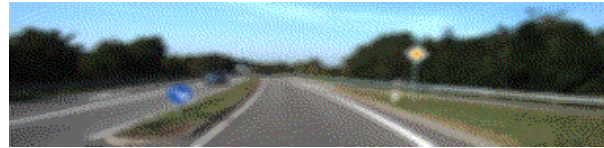
We thank the exceptional support from **Baidu Research, USA**

Know more about Baidu at this link: <http://research.baidu.com>



Co-located in Silicon Valley, Seattle and Beijing, Baidu Research brings together top talents from around the world to focus on future-looking fundamental research in artificial intelligence.

RoboDepth @ ICRA 2023



RoboDepth @ ICRA 2023



Track 1

Robust *Self-Supervised*
Depth Estimation for
Outdoor Scenes



Track 2

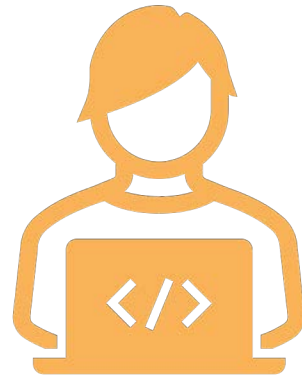
Robust *Supervised*
Depth Estimation for
Indoor Scenes

RoboDepth @ ICRA 2023



226

Registered Teams



66

Teams Submitted



1137


Valid Submissions

RoboDepth @ ICRA 2023



ICRA 2023 | The RoboDepth Competition (Track 1)
Organized by LingdongKong - Current server time: May 30, 2023, 6:57 a.m. UTC

First phase	End
Self-Supervised Depth Estimation	Competition Ends
Jan. 1, 2023, midnight UTC	May 25, 2023, 11:59 p.m. UTC



ICRA 2023 | The RoboDepth Competition (Track 2)
Organized by LingdongKong - Current server time: May 30, 2023, 6:57 a.m. UTC

First phase	End
Fully-Supervised Depth Estimation	Competition Ends
Jan. 16, 2023, midnight UTC	May 25, 2023, 11:59 p.m. UTC

Server:

<https://codalab.lisn.upsaclay.fr/competitions/9418>

Statistics:

- **137** registered teams
- **684** valid submissions

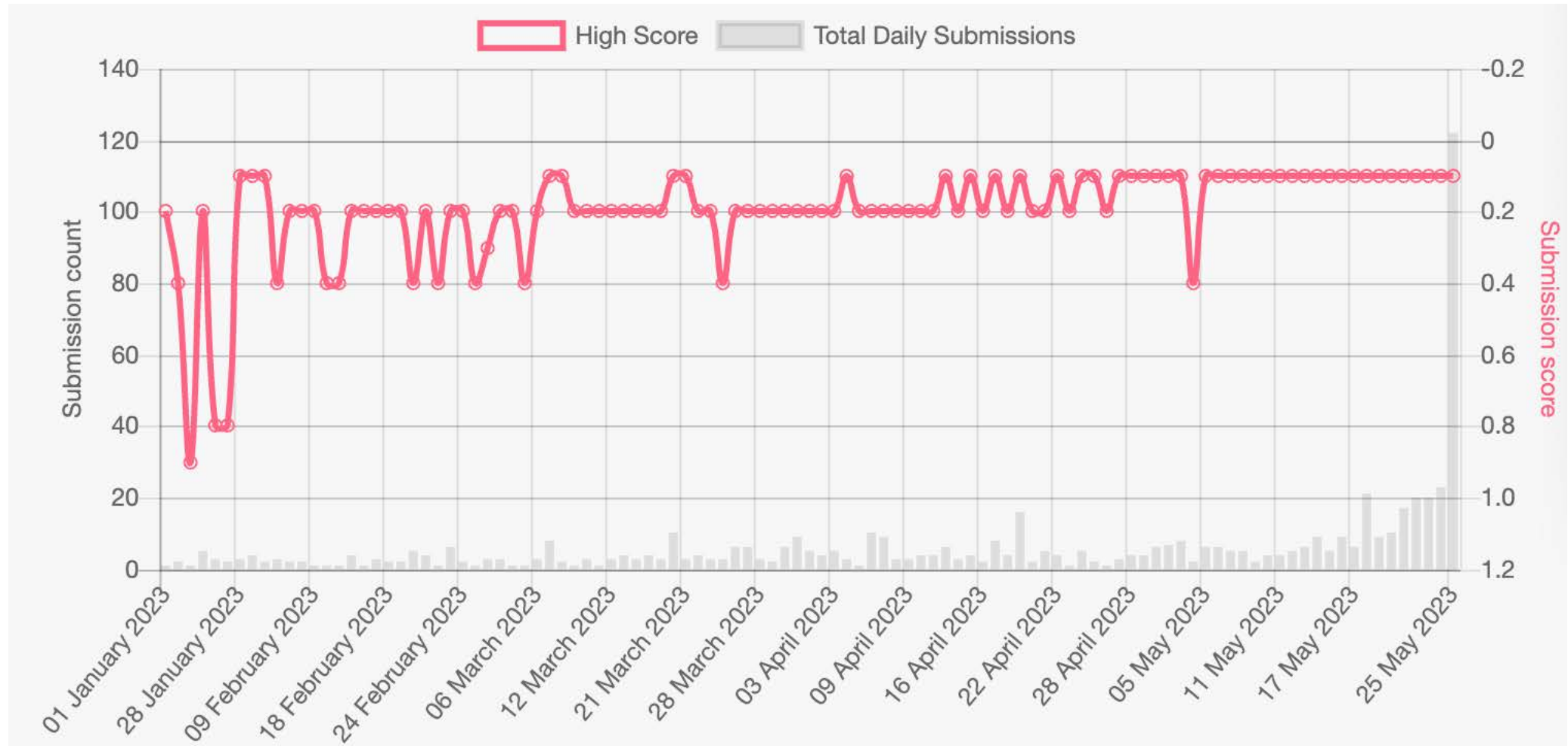
Server:

<https://codalab.lisn.upsaclay.fr/competitions/9821>

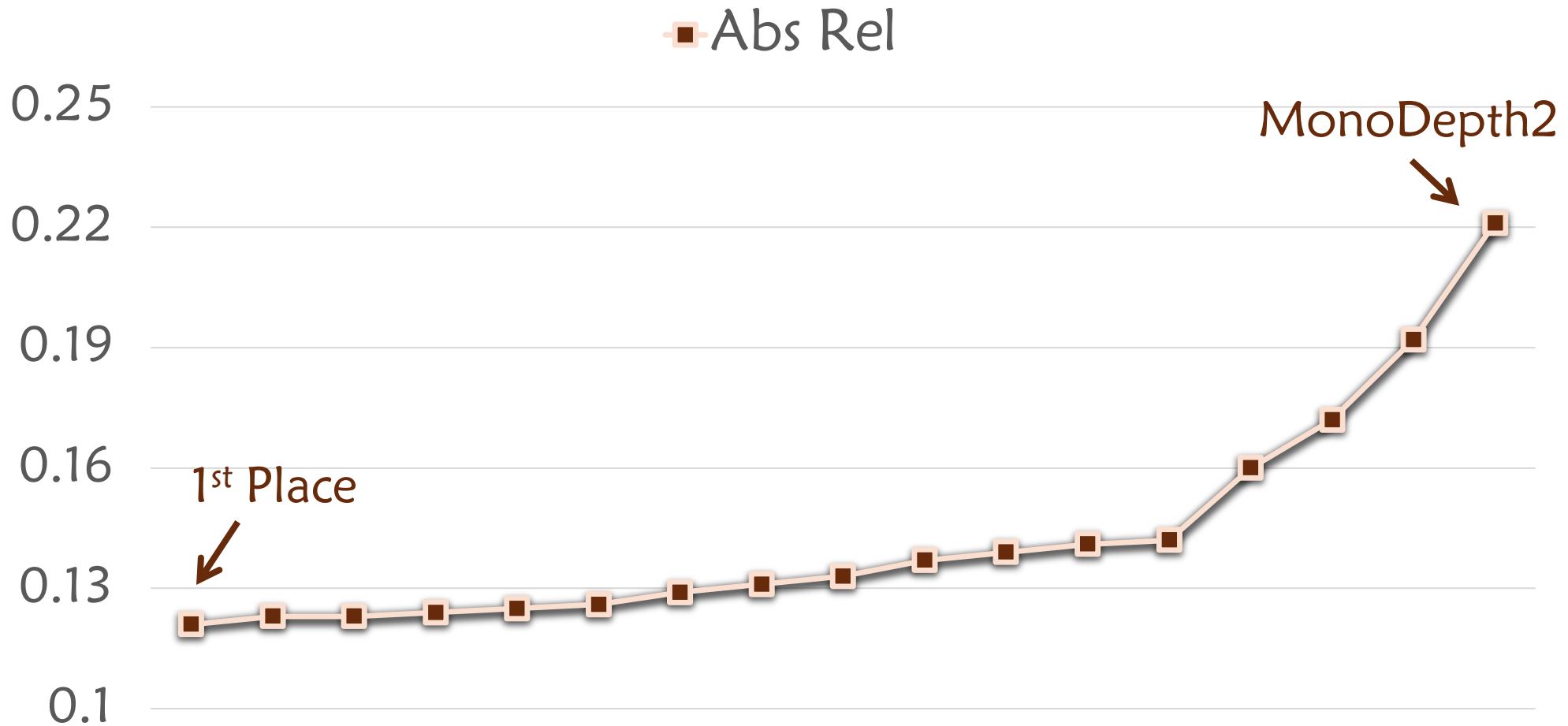
Statistics:

- **89** registered teams
- **453** valid submissions

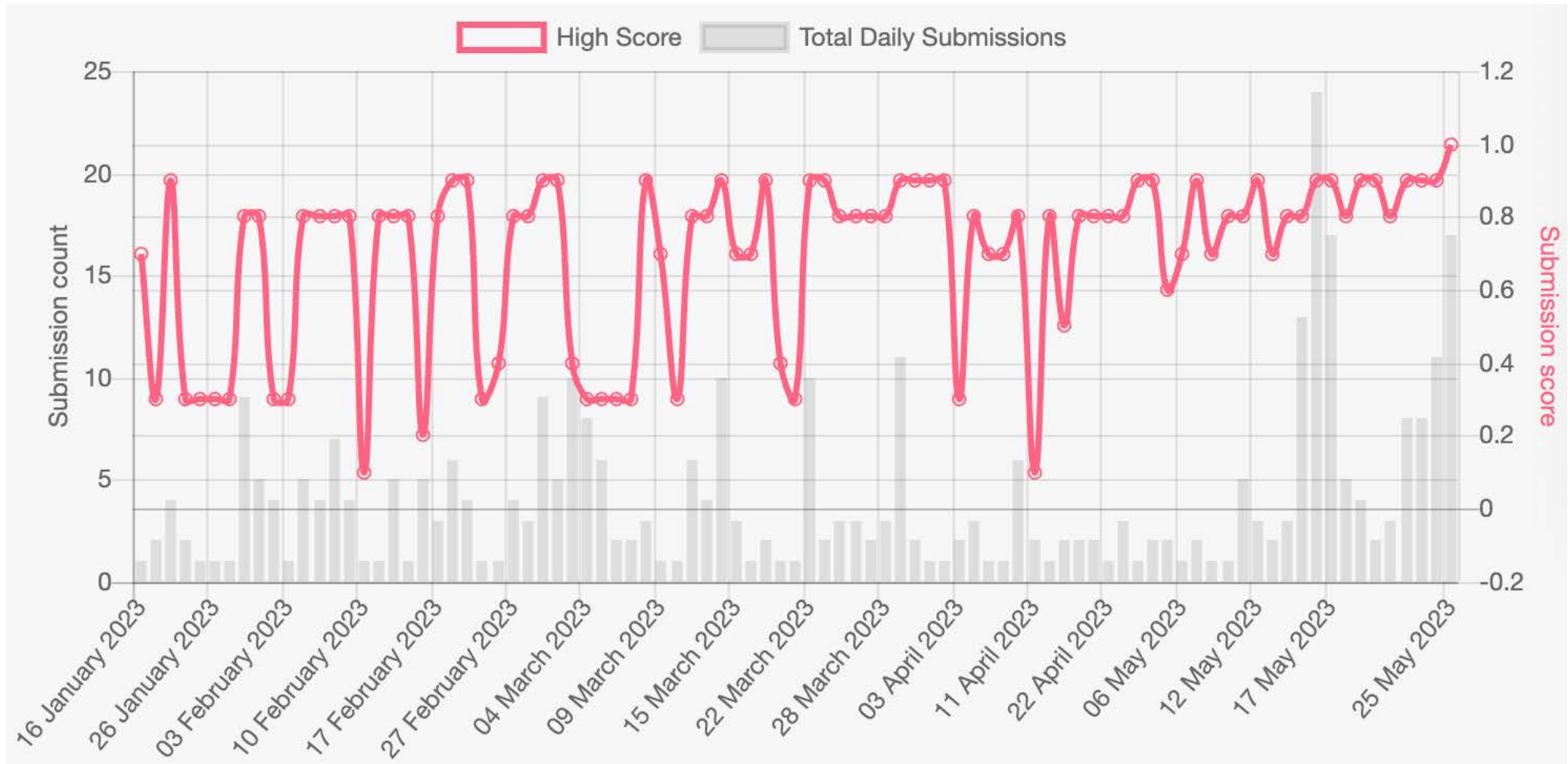
Statistics: Track 1



Statistics: Track 1



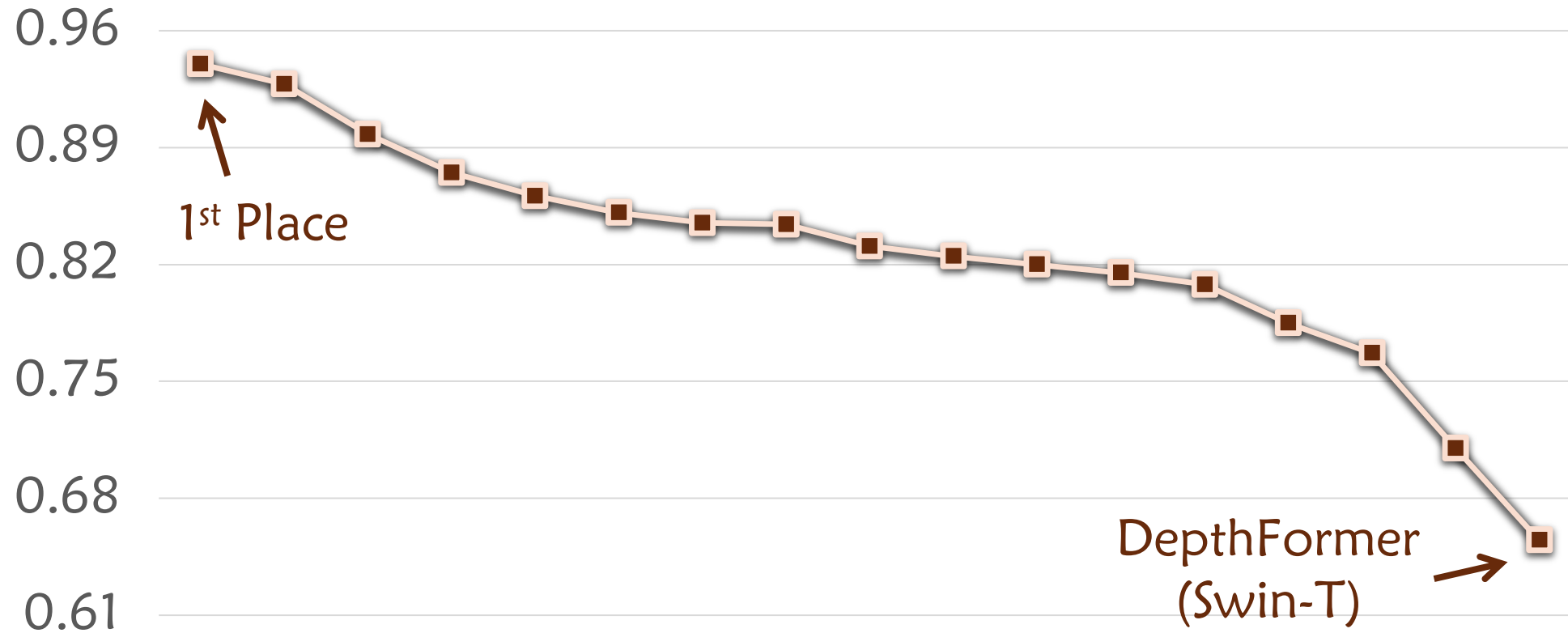
Statistics: Track 2



Statistics: Track 2



■ a1 Score



RoboDepth Benchmark



Statistics



18 corruption types from **three** main categories

Corruption Set:

- **KITTI-C**, 62730 images from 18 corruption types, simulated using the KITTI dataset
- **NYUDepth2-C**, 39240 image from 15 corruption types, simulated using the NYU Depth V2 dataset

Stylized Set:

- **KITTI-S**, 8364 images from 12 styles, simulated using the KITTI dataset

Taxonomy (Corruption)

weather & lighting

Brightness

Dark

Fog

Frost

Snow

Contrast

sensor & movement

Defocus Blur

Glass Blur

Motion Blur

Zoom Blur

Elastic

Color Quant

data & processing

Gaussian Noise

Impulse Noise

Shot Noise

ISO Noise

Pixelate

JPEG



Taxonomy (Stylization)



Cartoon



Murals



Sketch



Digital Art



Oil Painting



Stained Glass



Ink Painting



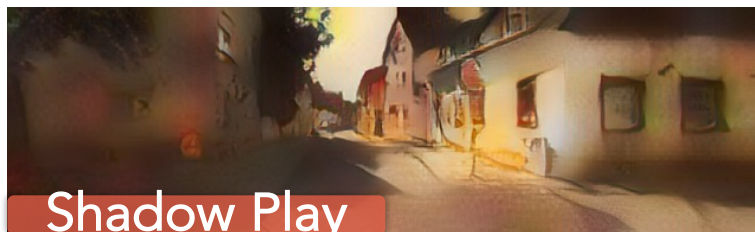
Pencil drawing



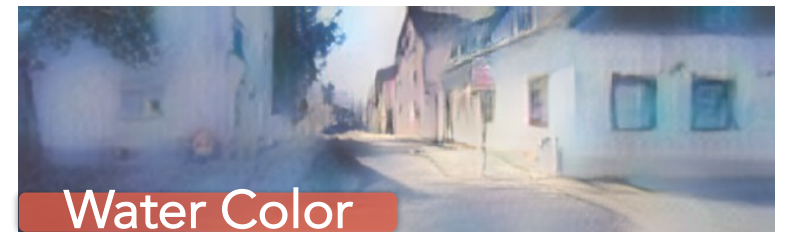
Relief



Kids' Drawing

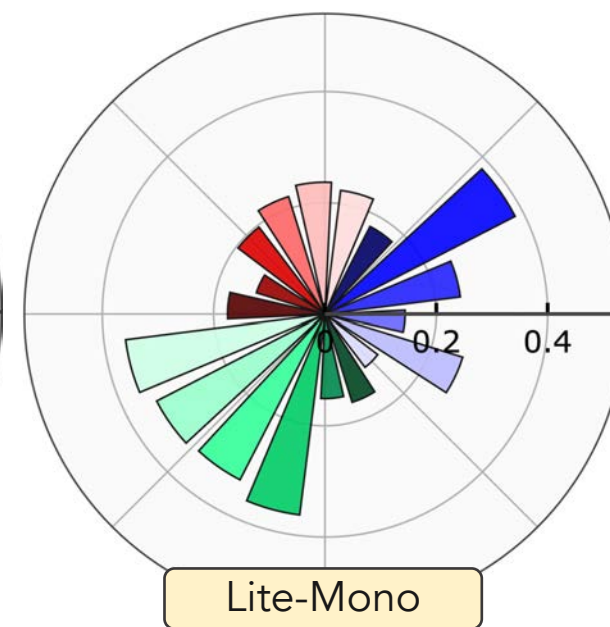
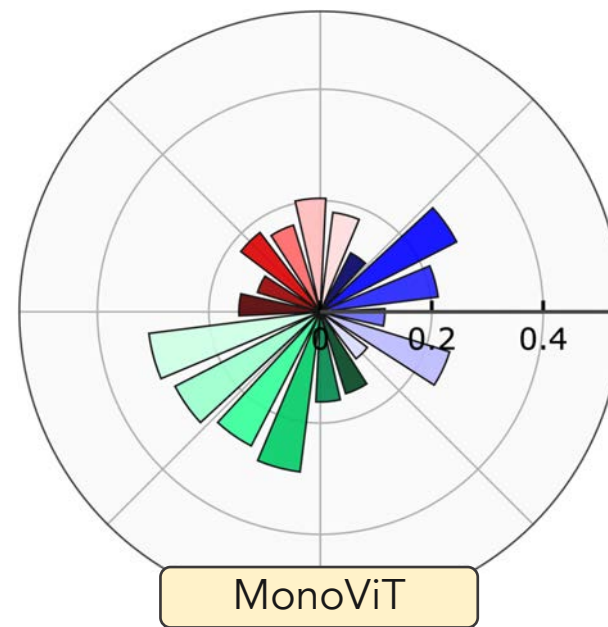
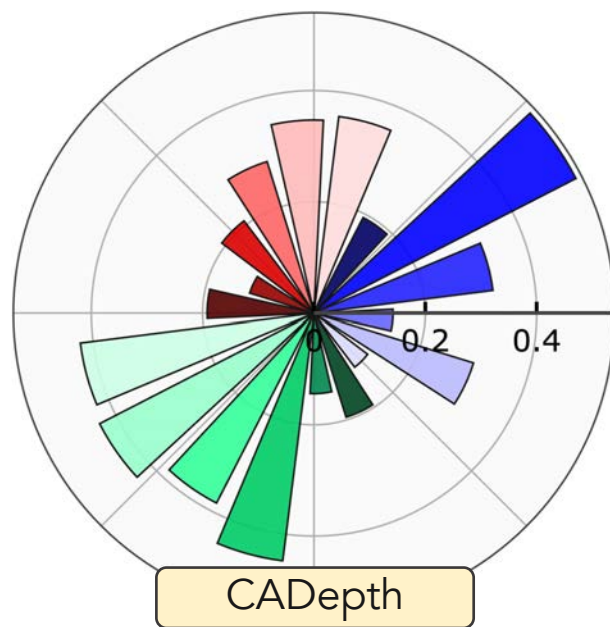
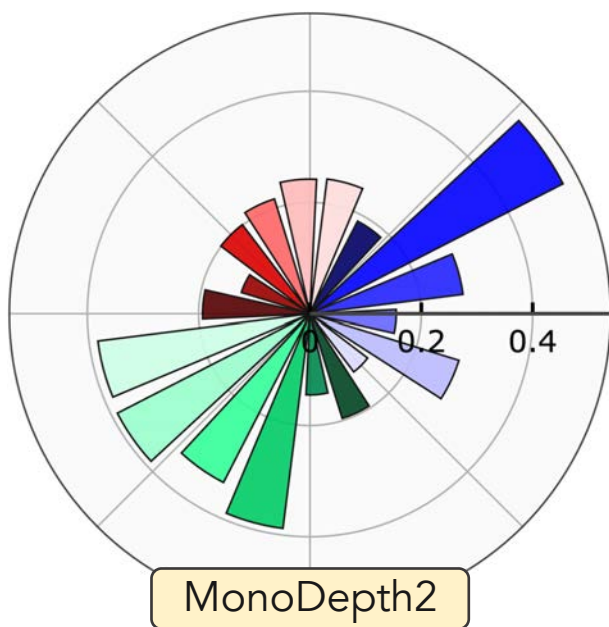


Shadow Play



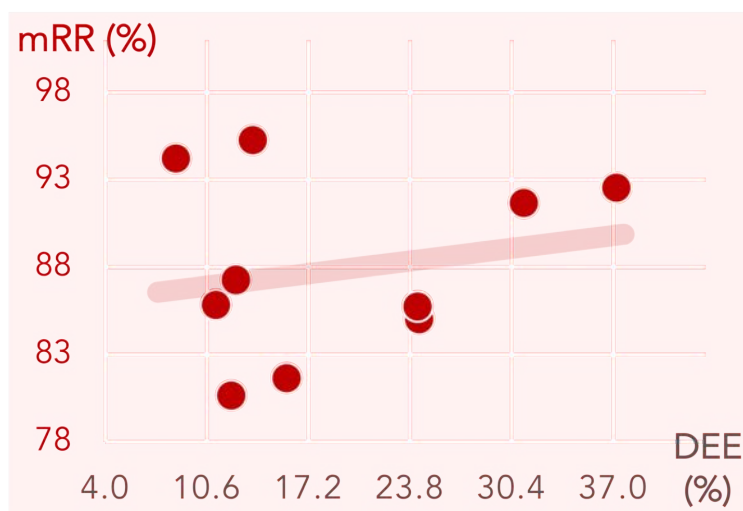
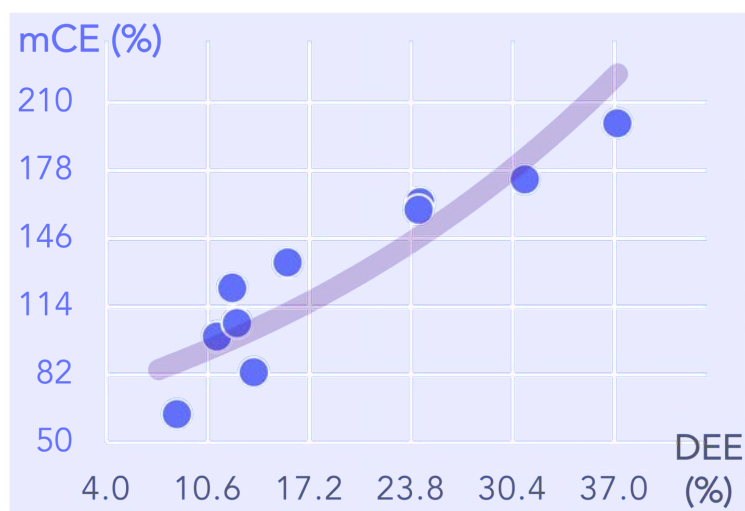
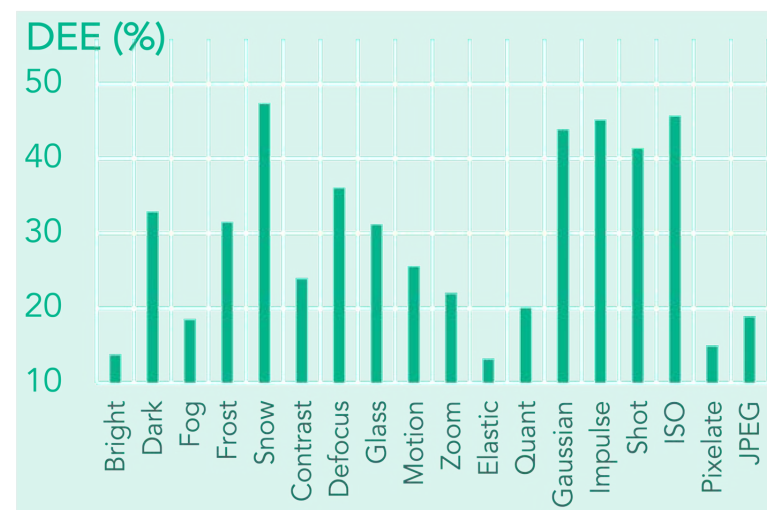
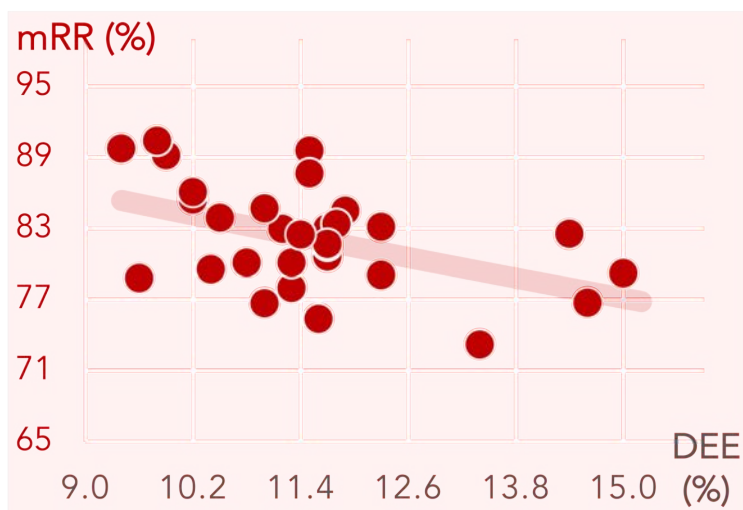
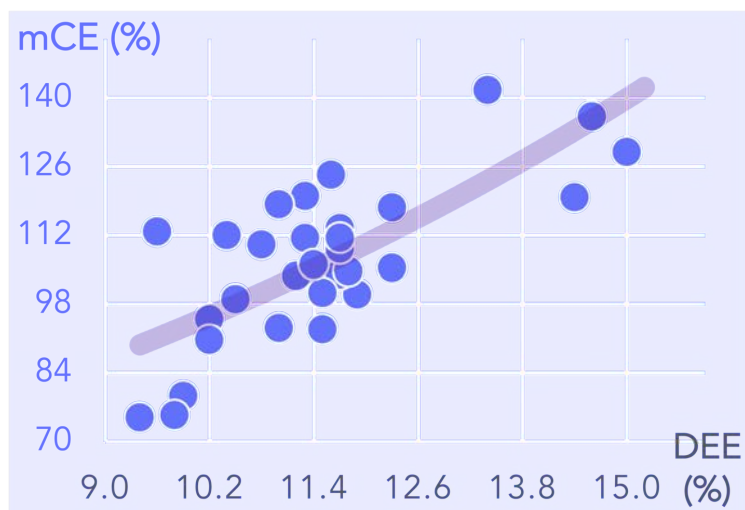
Water Color

Benchmark

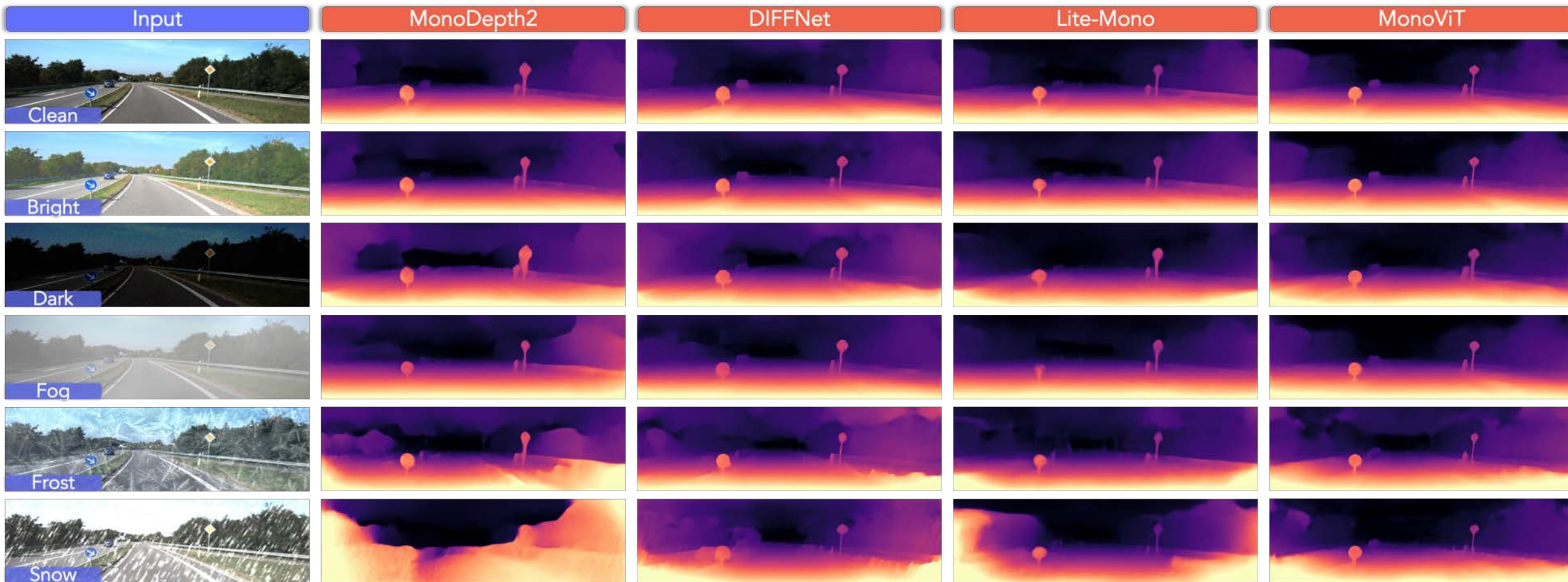


- Bright
- Dark
- Fog
- Frost
- Snow
- Contrast
- Defocus
- Glass
- Motion
- Zoom
- Elastic
- Quant
- Gaussian
- Impulse
- Shot
- ISO
- Pixelate
- JPEG

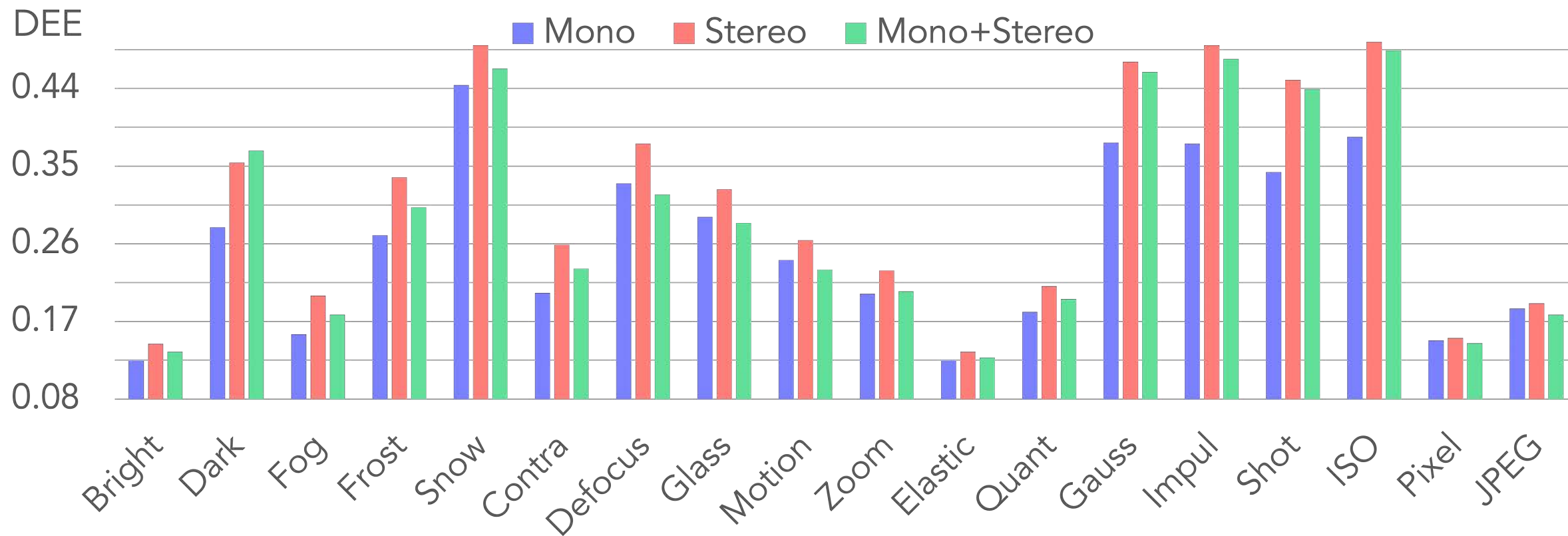
Benchmark



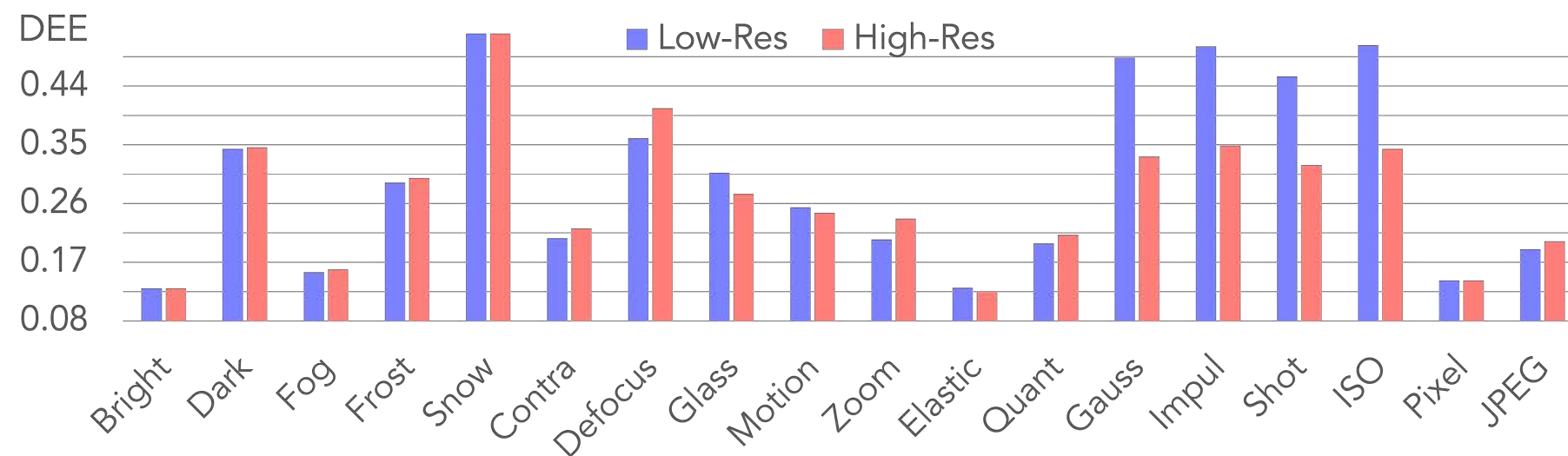
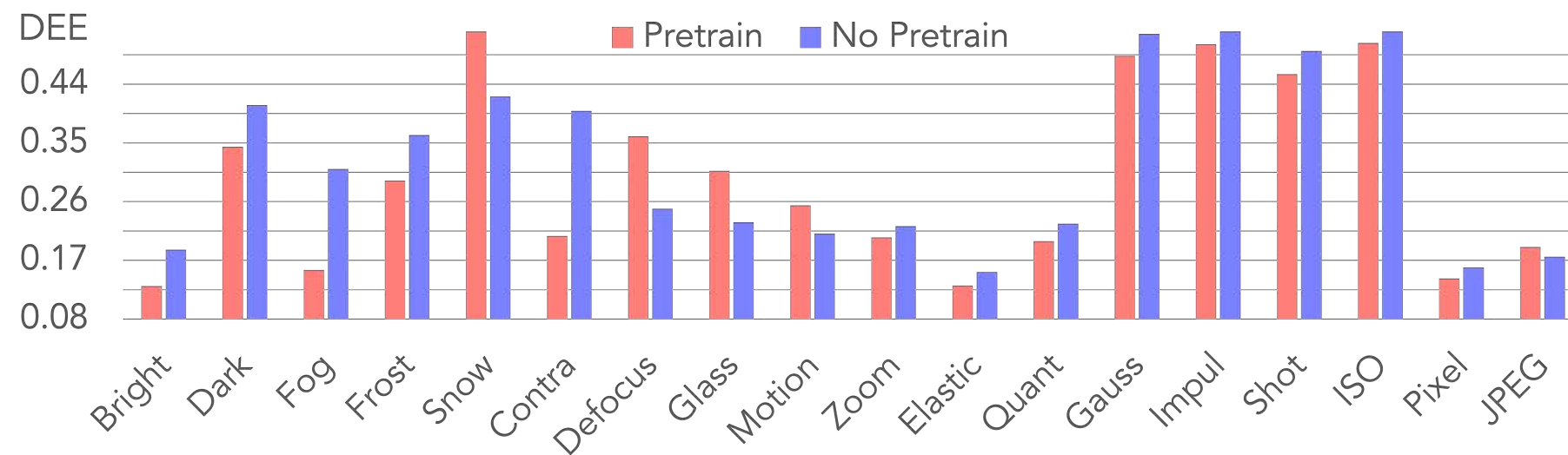
Qualitative Assessment



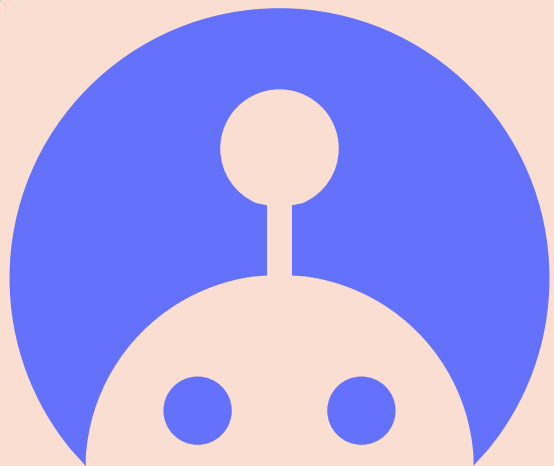
Robustness Analysis



Robustness Analysis



Know more about RoboDepth

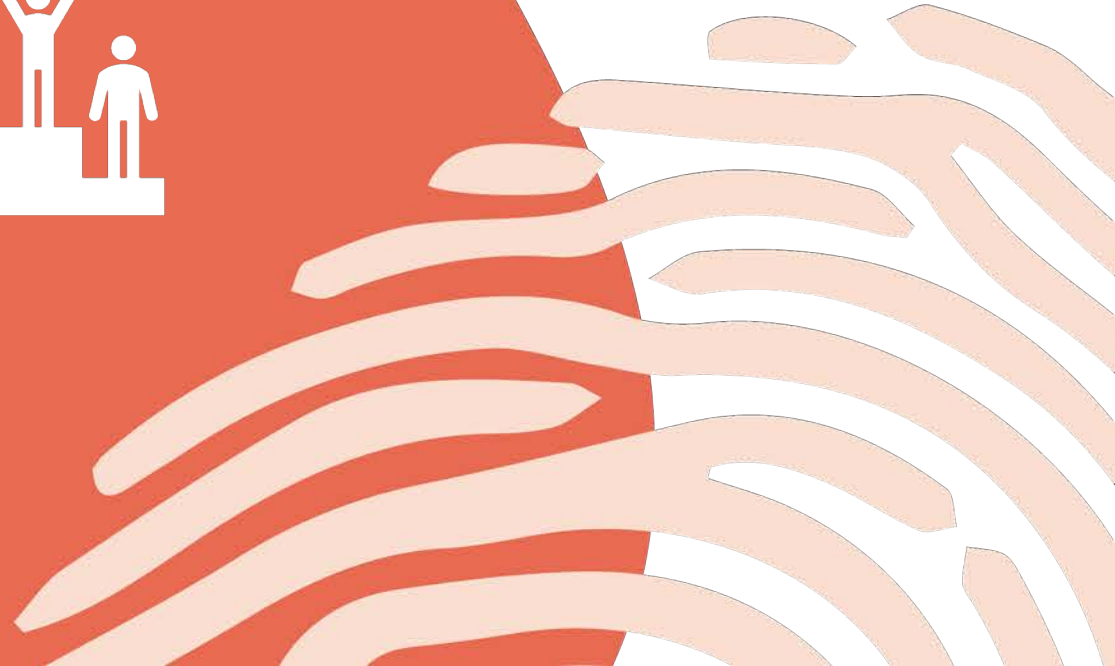


Benchmark Toolkit:

<https://github.com/ldkong1205/RoboDepth>

The RoboDepth Competition

Winning Teams





Track 1



OpenSpaceAI



USTC-IAT-United



YYQ



**Scent-Depth
Ensemble**

Track 2

USTCxNetEaseFuxi

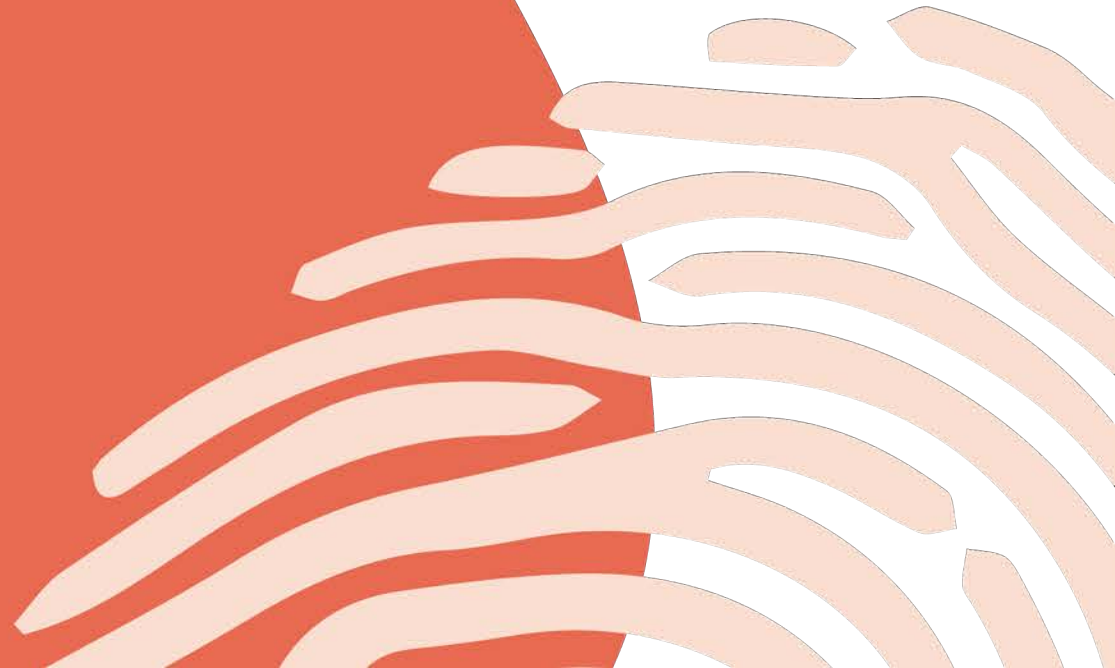
OpenSpaceAI

GANCU

AIIA-RDepth



Spotlight Talks (Track 1)



Innovative Prize in Track 1

Team Name:

Scent-Depth

Affiliation:

BUPT & ICT, CAS

The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The Innovative Prize in the category

Track 1: Robust Self-Supervised Depth Estimation

is presented to

Runze Chen, Haiyong Luo, Fang Zhao, Jingze Yu

for the submission

Scent-Depth



June 2023

Date

The RoboDepth Organizing Team

Organizer



Team:

Scent-Depth

Final Result:

Abs Rel: 0.137

RMSE: 5.276

$\delta < 1.25$: 0.813

Structure-Centric Robust Monocular Depth Estimation via Knowledge Distillation for ICRA 2023 The RoboDepth Challenge

Runze Chen^{1,2}, Haiyong Luo¹, Fang Zhao², Jingze Yu^{1,2}

¹School of Computer Science, Beijing University of Posts and Telecommunications

²Institute of Computing Technology, Chinese Academy of Sciences



北京邮电大学

Beijing University of Posts and Telecommunications



中国科学院计算技术研究所

INSTITUTE OF COMPUTING TECHNOLOGY, CHINESE ACADEMY OF SCIENCES



Q & A

Innovative Prize in Track 1

Team Name:

Ensemble

Affiliation:

Tsinghua University



The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The Innovative Prize in the category

Track 1: Robust Self-Supervised Depth Estimation

is presented to

Jiale Chen and Shuang Zhang

for the submission

Ensemble



June 2023

Date

The RoboDepth Organizing Team

Organizer

Team:

Ensemble

Final Result:

Abs Rel: 0.124

RMSE: 4.904

$\delta < 1.25$: 0.851

Robust Self-Supervised Monocular Depth Estimation Networks for Unseen Corruptions

Jiale Chen Shuang Zhang
Tsinghua University

3rd Place in Track 1

Team Name:

YYQ

Affiliation:

Harbin Institute of Technology



The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 3rd place in the category

Track 1: Robust Self-Supervised Depth Estimation

is presented to

Yuanqi Yao, Gang Wu, Jian Kuai, Xianming Liu, Junjun Jiang

for the submission

YYQ



June 2023

Date

The RoboDepth Organizing Team

Organizer

Team:

YYQ

Final Result:

Abs Rel: 0.123

RMSE: 4.983

$\delta < 1.25$: 0.848

Online Presentation



Q & A

2nd Place in Track 1

Team Name:

USTC-IAT-United

Affiliation:

USTC & CSU & Huawei Cloud



The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 2nd place in the category

Track 1: Robust Self-Supervised Depth Estimation

is presented to

Jun Yu, Xiaohua Qi, Jie Zhang, Mohan Jing, Pengwei Li, Zhen Kan, Qiang Ling

Liang Peng, Minglei Li, Di Xu, Changpeng Yang

for the submission

USTC-IAT-United



June 2023

Date

The RoboDepth Organizing Team

Organizer

Team:

USTC-IAT-United

Final Result:

Abs Rel: 0.123

RMSE: 4.873

$\delta < 1.25$: 0.861



The RoboDepth Challenge - ICRA 2023

team name: USTC-IAT-United

Jun Yu¹, Xiaohua Qi¹, Jie Zhang², Mohan Jing¹, Pengwei Li¹, Zhen Kan¹,
Qiang Ling¹, Liang Peng³, Minglei Li³, Di Xu³, Changpeng Yang³

¹ University of Science and Technology of China

²Central South University

³Huawei Cloud Computing Technology Co., Ltd.

1st Place in Track 1

Team Name:

OpenSpaceAI

Affiliation:

USTC & Deep Space Exploration Lab

The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 1st place in the category

Track 1: Robust Self-Supervised Depth Estimation

is presented to

Ruijie Zhu, Ziyang Song, Li Liu, Tianzhu Zhang

for the submission

OpenSpaceAI



June 2023

Date

The RoboDepth Organizing Team

Organizer



Team:

OpenSpaceAI

Final Result:

Abs Rel: 0.121

RMSE: 4.981

$\delta < 1.25$: 0.861



IRUDepth: Improve Robustness and Uncertainty of Self-Supervised Monocular Depth Estimation

OpenSpaceAI Team:

Ruijie Zhu¹, Ziyang Song¹, Li Liu¹, Tianzhu Zhang^{1,2}

¹University of Science and Technology of China

²Deep Space Exploration Lab

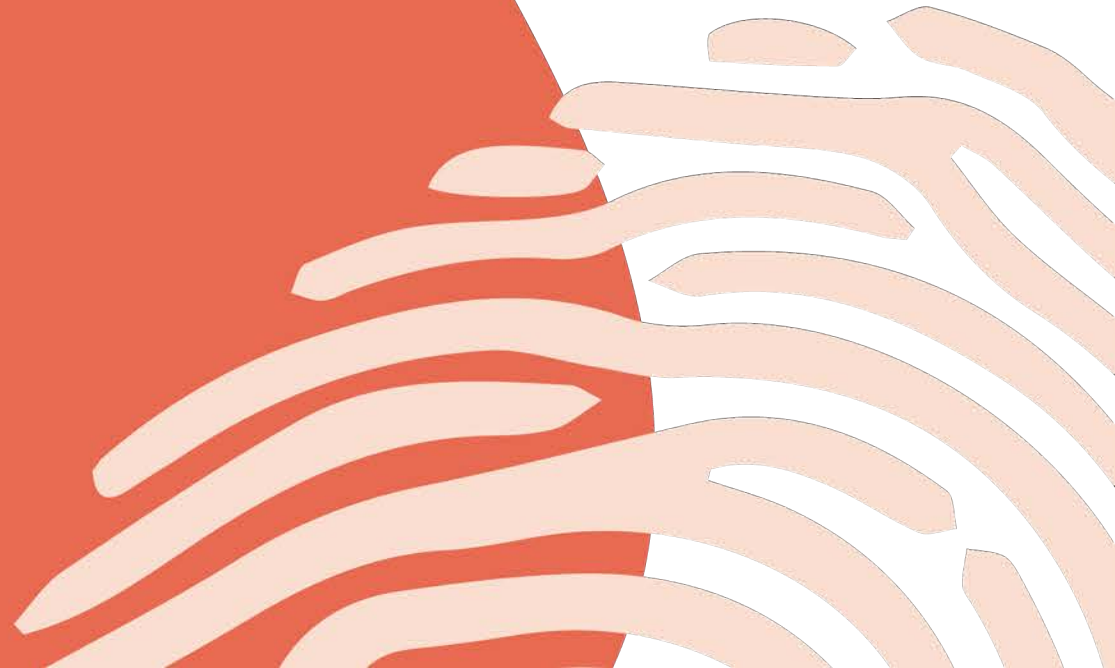


中国科学技术大学
University of Science and Technology of China





Spotlight Talks (Track 2)



Innovative Prize in Track 2

Team Name:

AIIA-RDepth

Affiliation:

Harbin Institute of Technology

The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The Innovative Prize in the category

Track 2: Robust Supervised Depth Estimation

is presented to

Sun Ao, Gang Wu, Zhenyu Li, Xianming Liu, Junjun Jiang

for the submission

A11A-RDepth



June 2023

Date

The RoboDepth Organizing Team

Organizer



Team:

A11A-RDepth

Final Result:

$\delta < 1.25$: 0.861

Abs Rel: 0.123

RMSE: 0.450

log10: 0.052

Online Presentation



Q & A

3rd Place in Track 2

Team Name:

GANCU

Affiliation:

Individual Researcher

The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 3rd place in the category

Track 2: Robust Supervised Depth Estimation

is presented to

Jiamian Huang, Baojun Li, Tao Liu

for the submission

GANCV



June 2023

Date

The RoboDepth Organizing Team

Organizer



Team:

GANCV

Final Result:

$\delta < 1.25$: 0.898

Abs Rel: 0.104

RMSE: 0.391

log10: 0.045

A Depth Estimation Solution for Track 2 of the RoboDepth Challenge

Jiamian Huang, Baojun Li

GANCV

June 2023

2nd Place in Track 2

Team Name:

OpenSpaceAI

Affiliation:

USTC & Deep Space Exploration Lab

The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 2nd place in the category

Track 2: Robust Supervised Depth Estimation

is presented to

Li Liu, Ruile Zhu, Ziyang Song, Tianzhu Zhang

for the submission

OpenSpaceAI



June 2023

Date

The RoboDepth Organizing Team

Organizer



Team:

OpenSpaceAI

Final Result:

$\delta < 1.25$: 0.928

Abs Rel: 0.095

RMSE: 0.341

log10: 0.040



Diffusion model for Robust Depth Estimation

OpenSpaceAI Team:

Li Liu¹, Ruijie Zhu¹, Ziyang Song¹, Tianzhu Zhang^{1,2}

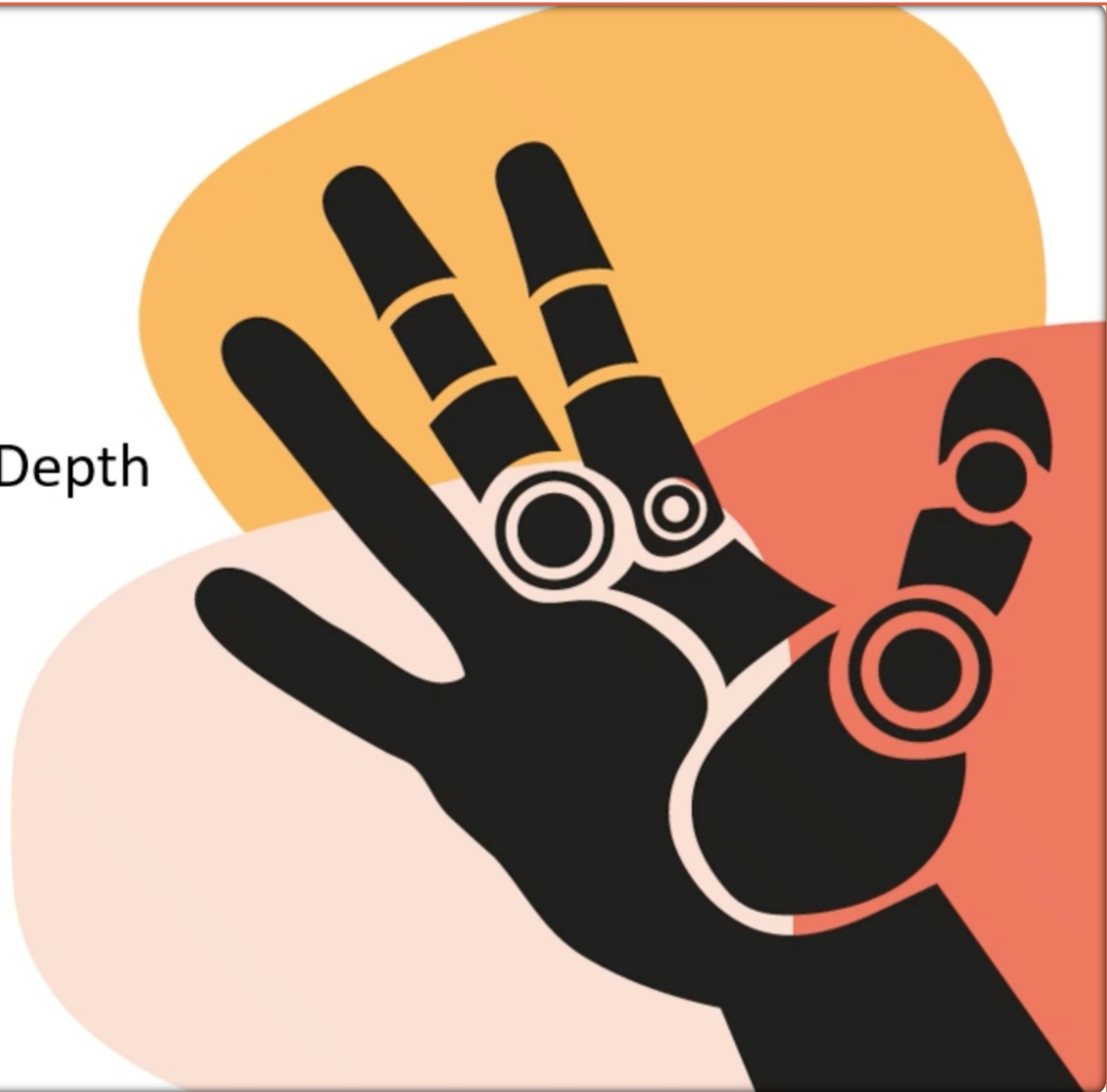
¹University of Science and Technology of China

²Deep Space Exploration Lab



中国科学技术大学

University of Science and Technology of China





Q & A

1st Place in Track 2

Team Name:

USTC x NetEase Fuxi

Affiliation:

USTC & NetEase Fuxi



The RoboDepth Challenge

In conjunction with the 40th IEEE Conference on Robotics and Automation, London, UK

The 1st place in the category

Track 2: Robust Supervised Depth Estimation

is presented to

Jun Yu, Mohan Jing, Pengwei Li, Xiaohua Qi, Cheng Jin

Yingfeng Chen, Jie Hou

for the submission

USTC×NetEaseFuxi



June 2023

Date

The RoboDepth Organizing Team

Organizer

Team:

USTC×NetEaseFuxi

Final Result:

$\delta < 1.25$: 0.940

Abs Rel: 0.088

RMSE: 0.347

log10: 0.038



The RoboDepth Challenge - ICRA 2023

Jun Yu¹, Mohan Jing¹, Pengwei Li¹, Xiaohua Qi¹,
Cheng Jin², Yingfeng Chen², Jie Hou²

¹University of Science and Technology of China & ²NetEaseFuxi

Public Resources

Video Recording & Report:

<https://robodepth.github.io>

Benchmark Toolkit:

<https://github.com/ldkong1205/RoboDepth>



Ask Anything

Thank You!

See You Next Time

