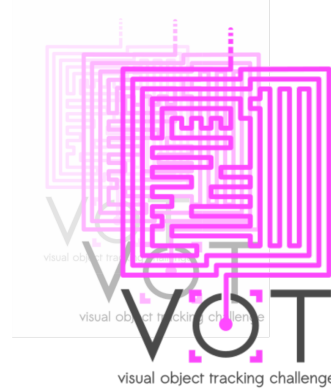




The 9th Visual Object Tracking Challenge Results VOT-LT2021

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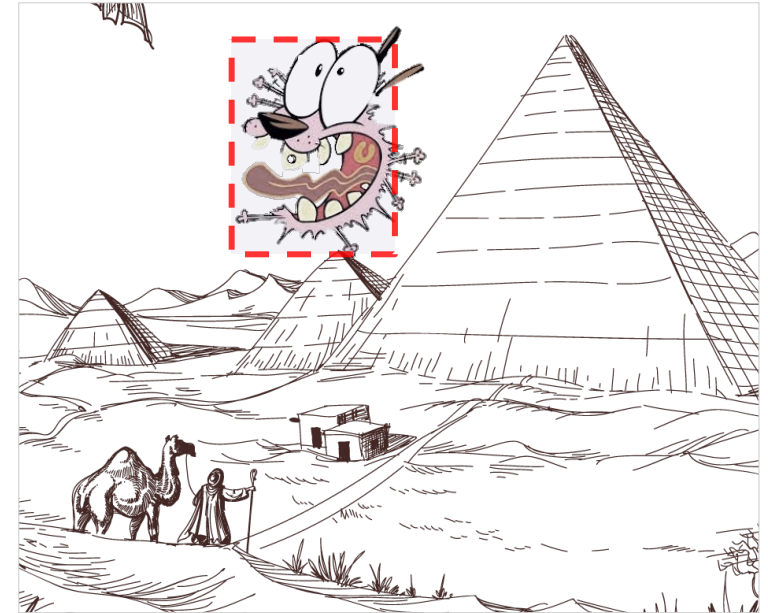
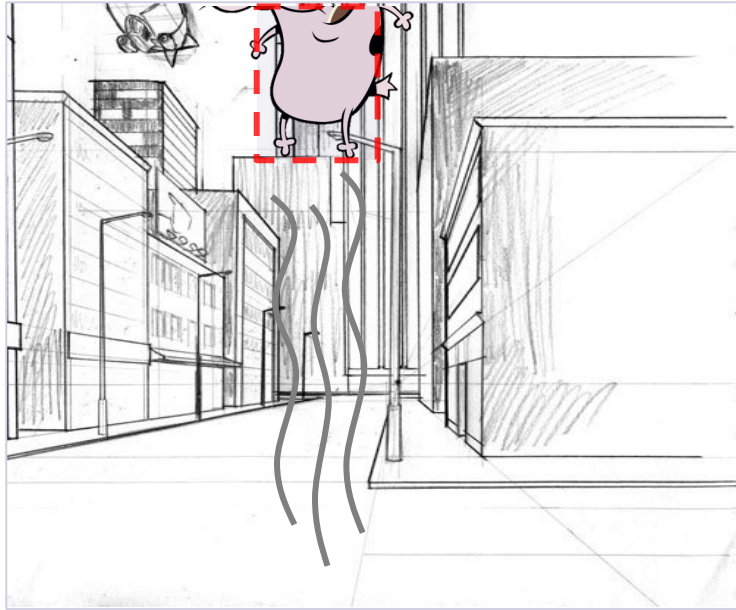
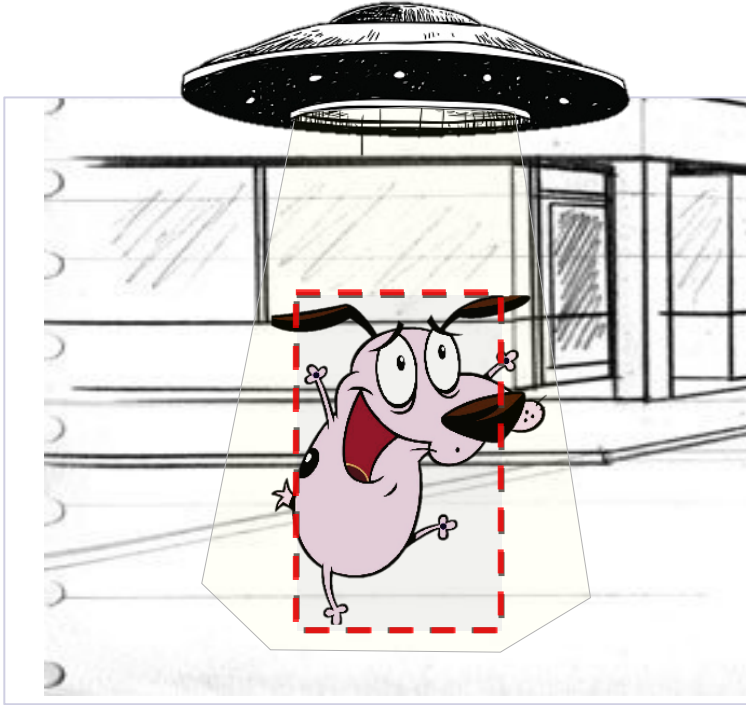
Outline

1. Scope of the VOT2021 LT challenges
2. Results overview (VOT2021 LT)
3. Winner announcement (VOT2021 LT)

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VOT2021 LT CHALLENGE: OVERVIEW

VOT2021 long-term challenge (VOT-LT2021)

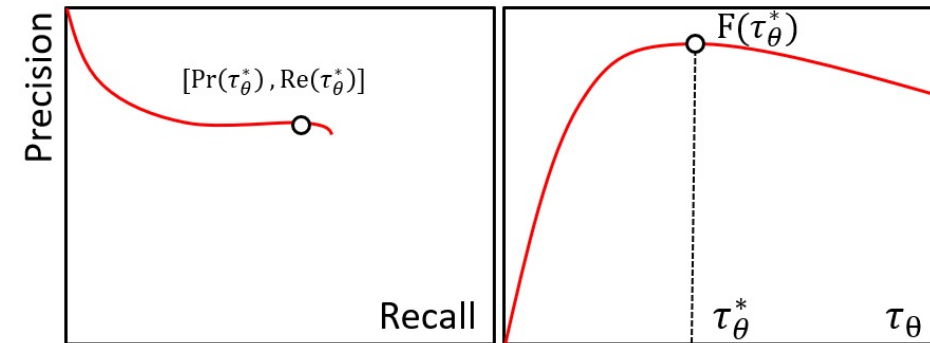
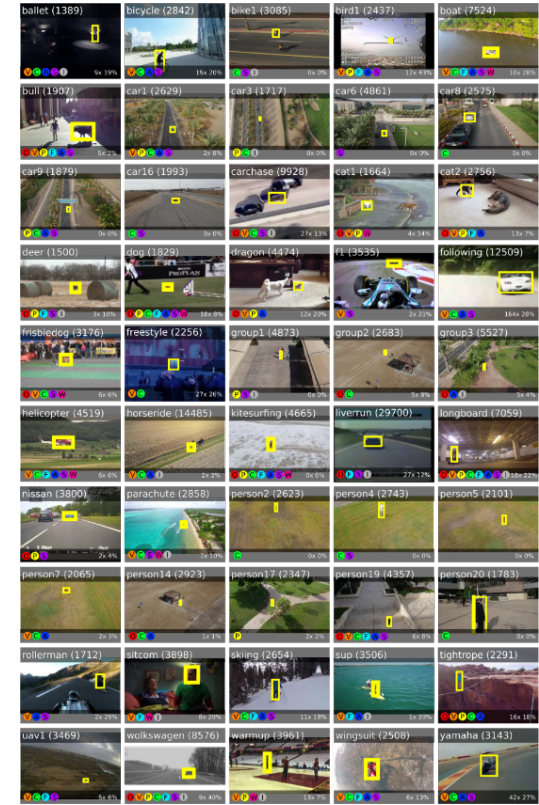


- Required long-term tracker properties:
 - Determine whether the target has been lost (or disappeared)
 - Re-detect the target when it reappears
- Tracker output at each frame: bounding box + certainty score

VOT2021 long-term challenge (VOT-LT2021)

- VOT-LT2019 dataset used
 - **50 challenging sequences** of diverse objects (persons, cars, motorcycles, bicycles, boats, animals, etc.)
 - Average sequence length > **4k frames**
 - Average per sequence disappearance: **10**
 - Average target absence period: **52 frames**
- Initialized at first frame, no reset at target loss
- Tracking properties measured:
- Tracking Precision, Recall & F-score¹:

$$\text{Pr}(\tau_\theta), \text{Re}(\tau_\theta), F(\tau_\theta)$$



¹Lukežič, et al., Now you see me: evaluating performance in long-term visual tracking, TCyb2020

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VOT-LT2021 CHALLENGE RESULTS

VOT-LT2021 challenge overview

- 13 trackers tested
- All Trackers were from LT₁ Class
 - *Explicit target absence detection and re-detection implemented*
- The architectures are getting more and more mixed
 - *SuperDiMP, STARK and Meta-Updater are the TOP3 popular methods*

Features



Architecture



VOT-LT2021 challenge overview

- Top 3 trackers: *mlpLT*, *STARK_LT*, and *STARK_RGBD_LT*

- ✓ *Combination of Transformer-based tracker and CNN-based tracker*

- Top performance: *mlpLT*

- ✓ *Trackers: STARK[1] + SuperDiMP[2]*

- ✓ *Online learned target verifier*

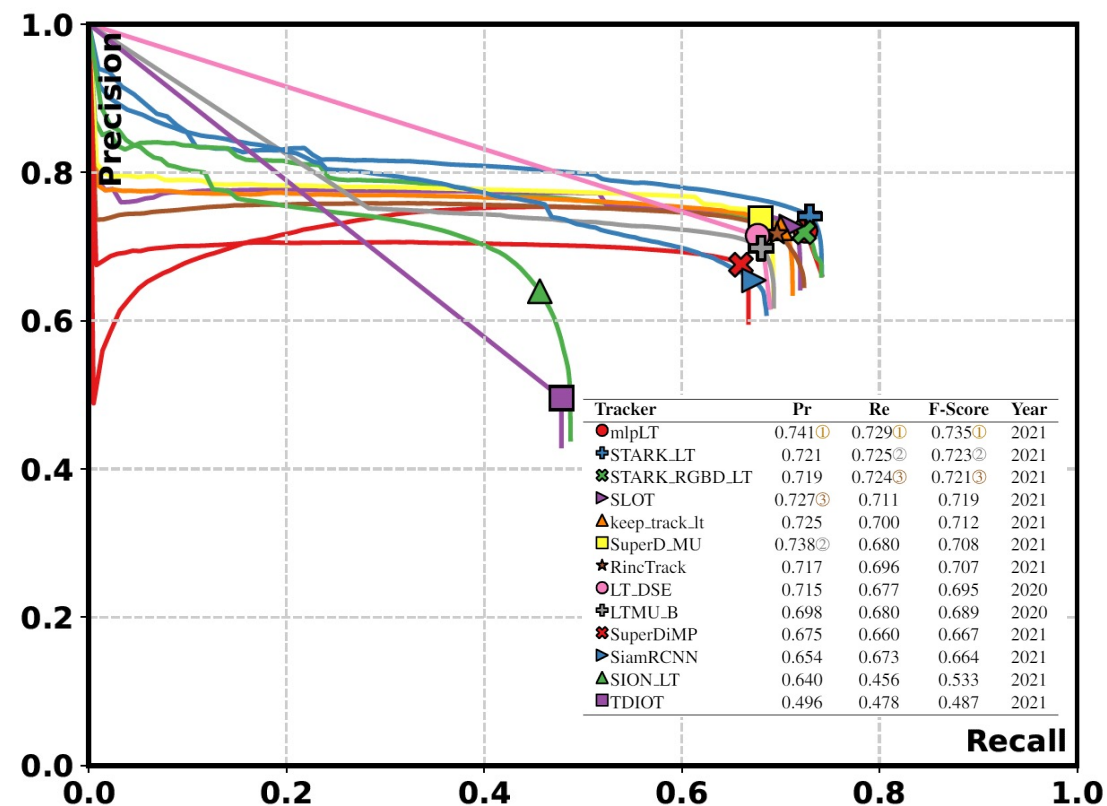
- Second-best (~1.2% Worse) : *STARK_LT*

- ✓ *ST: STARK[1] (Transformer)*

- ✓ *Re-Det: GlobalTrack[3]*

- Baseline: *LT_DSE* (winner of VOT-LT2019)

- ✓ *7 trackers outperforms the baseline*



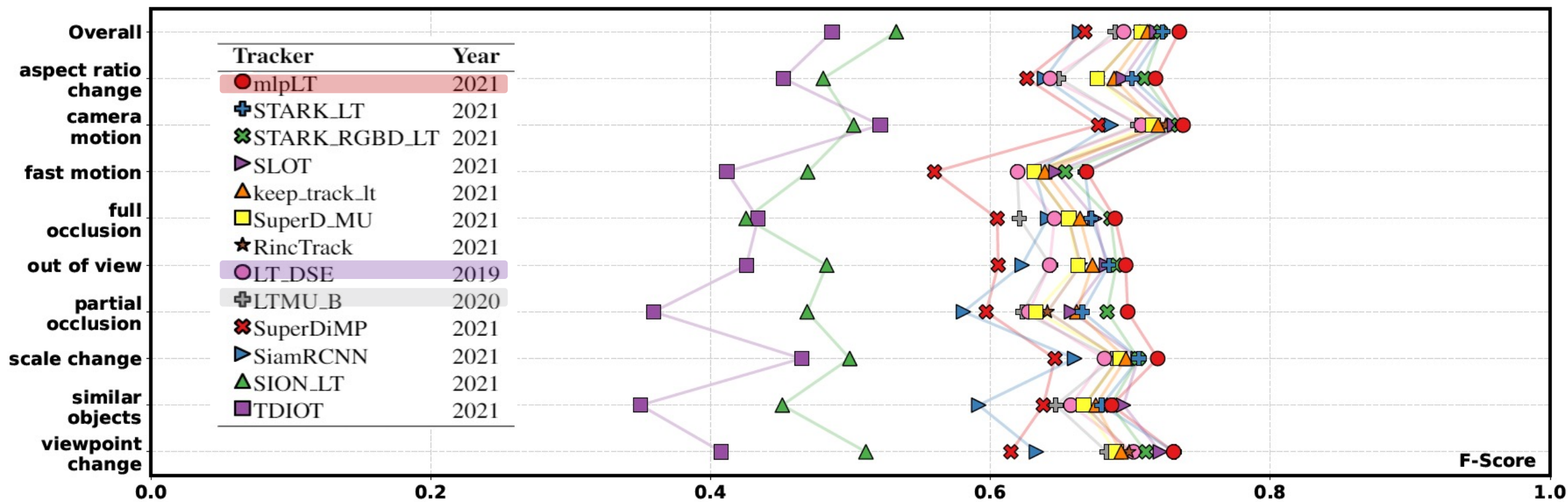
[1] Yan et al. ICCV2021

[2] Bhat et al. ICCV2019

[3] Huang et al. AAAI2020

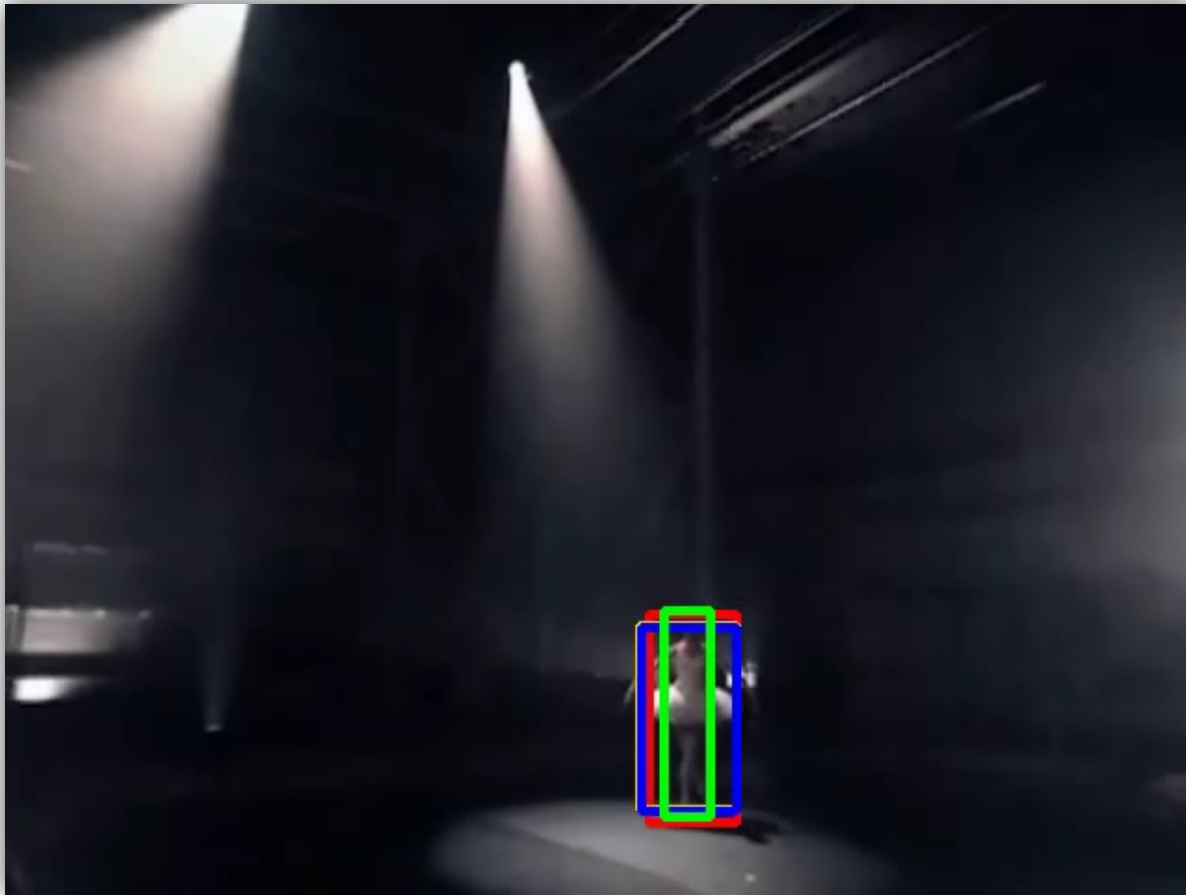
Advances since VOT-LT (2019)

- **mlpLT** outperformers **winner 2020** and **winner 2019** in most of all attributions
 - Partial occlusion, scale change, and viewpoint change



Advances since VOT-LT (2019)

- Partial occlusion, scale change, and viewpoint change



— mlpLT (winner2021) — LTMU_B (winner2020) — LT_DSE (winner2019) — GT

Advances since VOT-LT (2019)

- Failure cases: small object, full occlusion and fast motion



— mlpLT (winner2021) — LTMU_B (winner2020) — LT_DSE (winner2019) — GT

VOT2021 LT challenges summary

- VOT-LT2021:
 - Fast performance improvements has achieved
 - **Transformer** based method is outperforming
 - *The VOT-LT2021 challenge's top-three performers all apply Transformer-based tracker structure for short-term localization and long-term re-detection.*
 - Deep LT **architectures are stabilized and well-mixed**
 - Still small object, full occlusion and fast motion are challenging.

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VOT2021 LT WINNER ANNOUNCEMENTS

Alter Logos



Winners talks in Session III
(15:30-16:15, GMT-4 time zone)

VOT-LT2021 Winners:

mlpLT by: **Matteo Dunnhofer, Kristian Simonato, and Christian Micheloni**

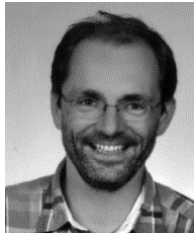
“Fusing Complementary Trackers for Long-term Visual Tracking”

Thanks

- The VOT2021 committee



M. Kristan



J. Matas



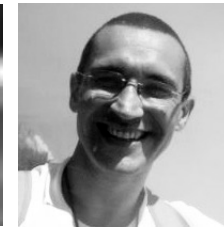
A. Leonardis



J. K. Kamarainen



H. J. Chang



R. Pflugfelder



G. Fernandez



L. Čehovin



A. Lukežič



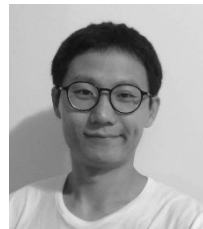
M. Felsberg



O. Drbohlav



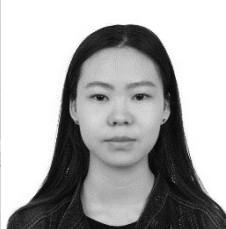
Z. Zhang



Y. Song



Y. Jinyu



Z. Yushan



C. Mayer



G. Häger



J. Kapyla

- Everyone who participated or contributed

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- VOT2021 sponsor:



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