

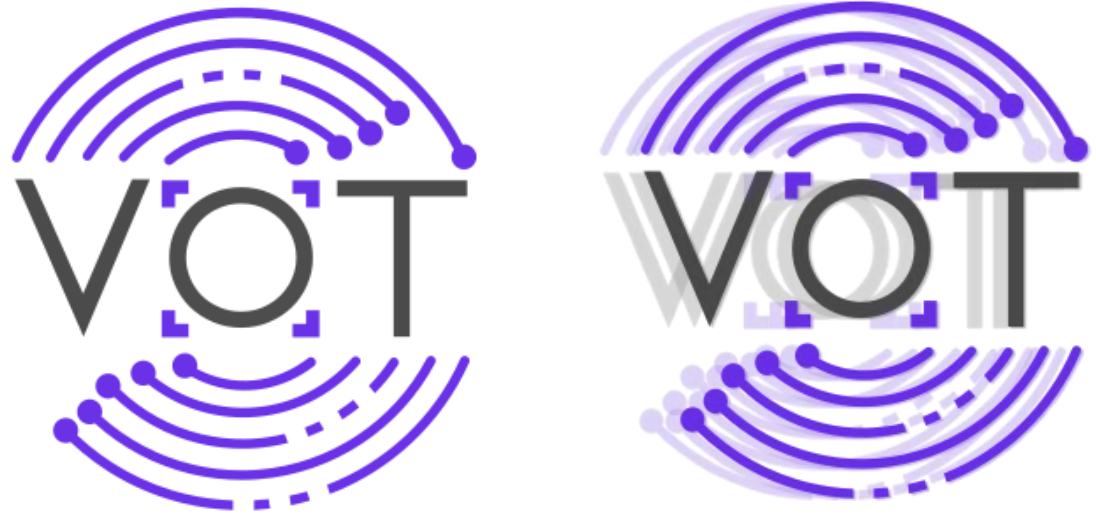


The 3rd Visual Object Tracking Segmentation VOTS/RT2025 Challenge Results

Matej Kristan, Jiří Matas, Pavel Tokmakov, Alan Lukežič, Michael Felsberg, Luka Čehovin Zajc, Khanh-Tung Tran, Xuan-Son Vu, Johanna Björklund, Michal Neoral, Hyung Jin Chang, Gustavo Fernández

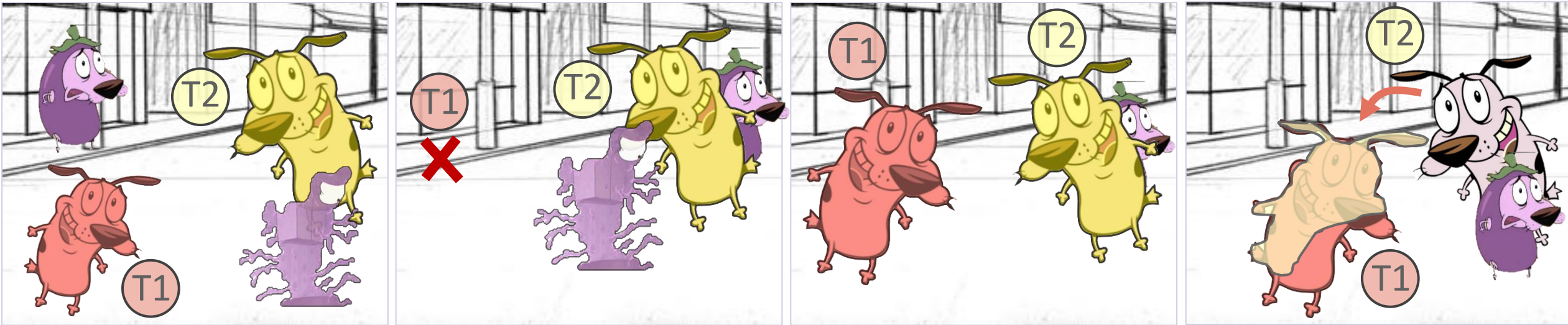
Outline

- Scope of the challenges
- Evaluation setup
- Results
- Winner announcements



The VOTS2025 challenge scope

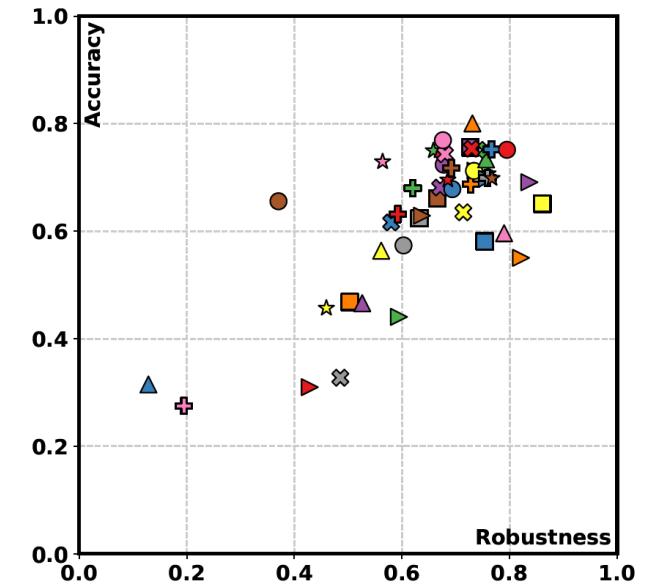
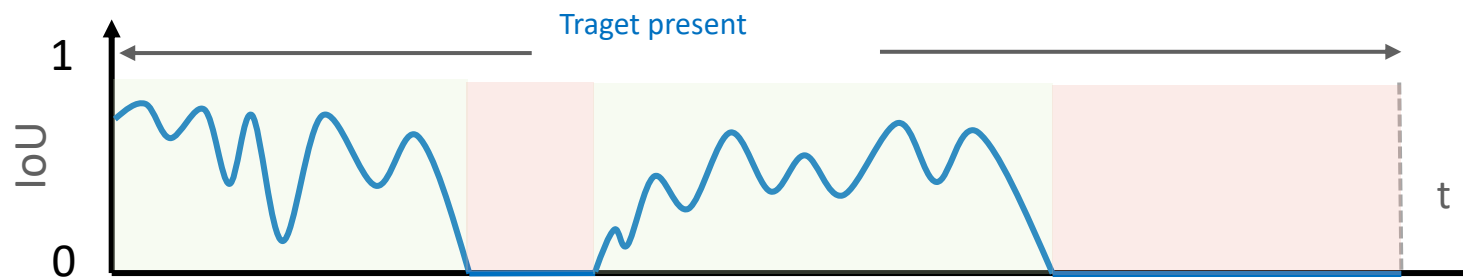
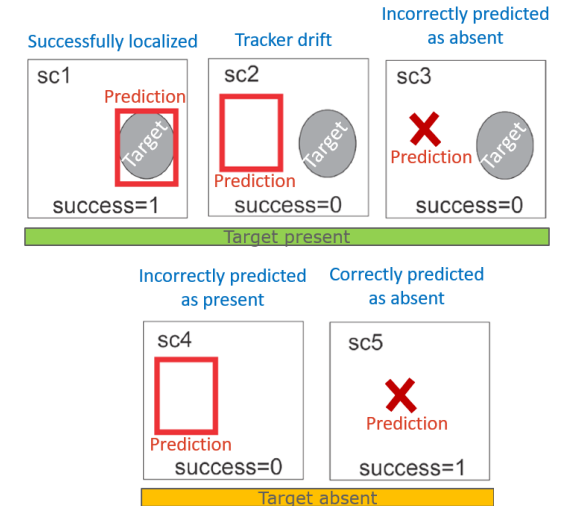
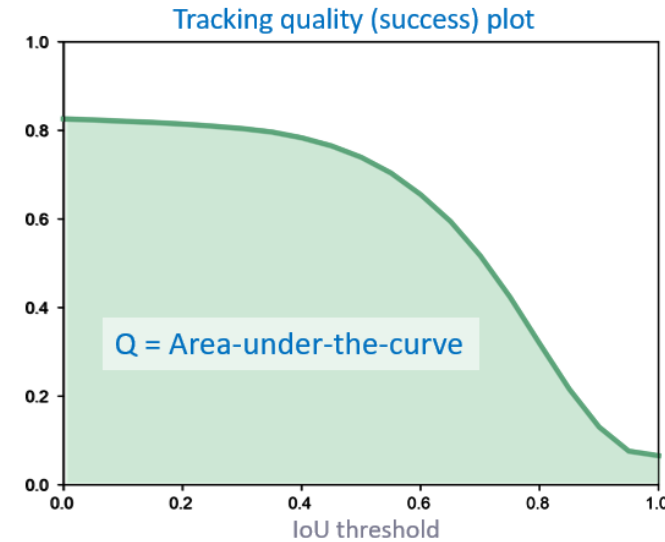
- General object Short/Long-term, Single/Multi-target segmentation trackers
- Initialize on all targets in the first frame and report position in the rest



- Determine the **target absence** and **redetect** when it reappears
- **Drifting** off the target to **background** or **another object** is considered a failure

VOTS performance measures

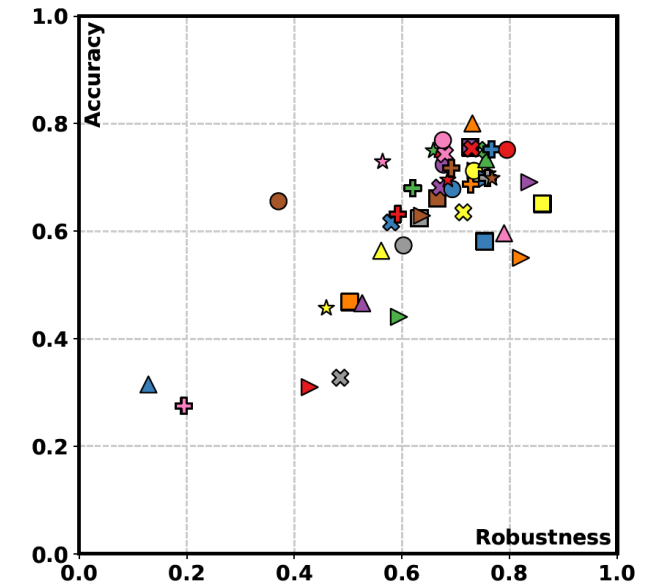
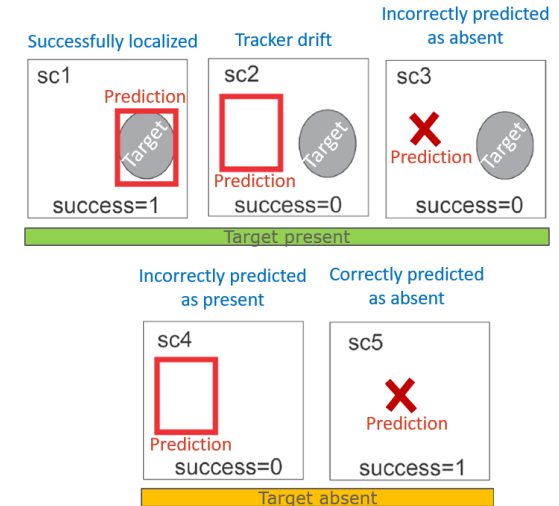
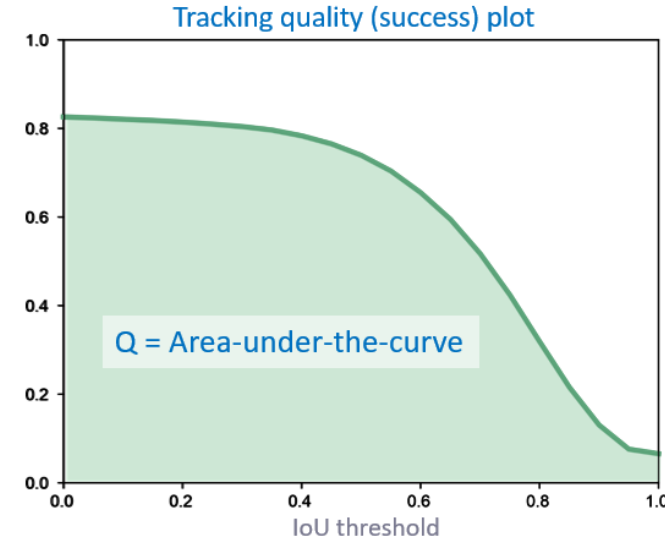
- Introduced in VOTS2023^[1]
- Primary: **Tracking quality, Q**
 - (i) localization, (ii) re-detection,
 - (iii) target absence identification
- Auxiliary performance measures:
 - Accuracy/Robustness**



¹Kristan et al., VOTS2023

VOTS performance measures

- Introduced in VOTS2023^[1]
- Primary: **Tracking quality, Q**
 - (i) localization, (ii) re-detection,
 - (iii) target absence identification
- Auxiliary performance measures:
 - Accuracy/Robustness**
 - “Why did the tracker fail while target visible?”*
(Not Reported Error, **NRE** ; Drift Rate Error, **DRE**)
 - “How well is target absence determined?”*
(Absence Detection Quality, **ADQ**)



¹Kristan et al., VOTS2023

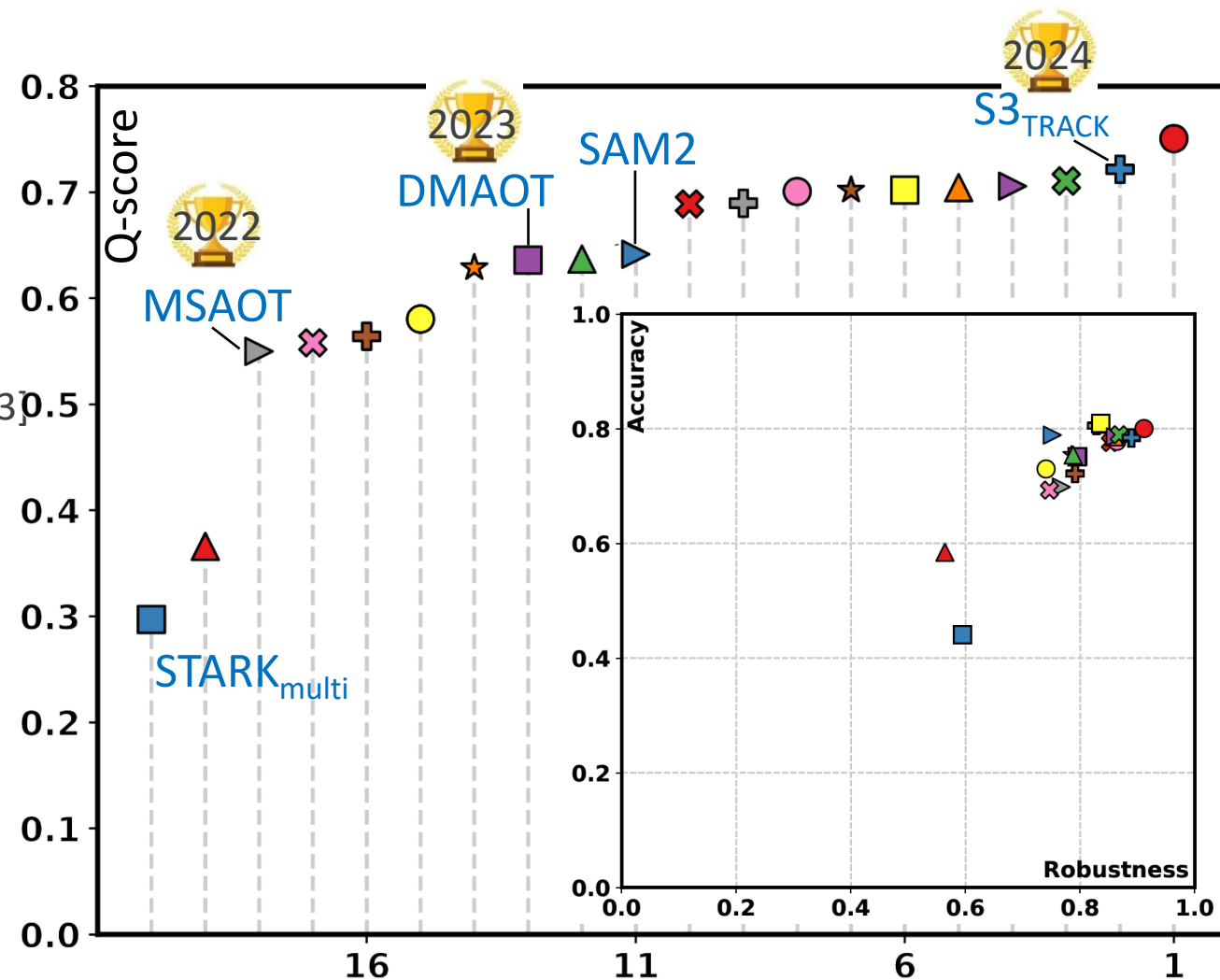
VOTS2025 dataset: same as VOTS2023

- Stats: 144 sequences ; 341 targets ; 168 targets leave the FOV at least once
- Sequence properties:
 - min/max = 63/10.7k frames
 - On average 2.37 targets per sequence annotated
 - Median target absence: 18 frames
- To prevent overfitting:
 - Sequences + initialization frames GT publicly available.
 - GT of test frames sequestered, evaluation carried out on a dedicated server.



VOTS2025 challenge results: 20 trackers tested

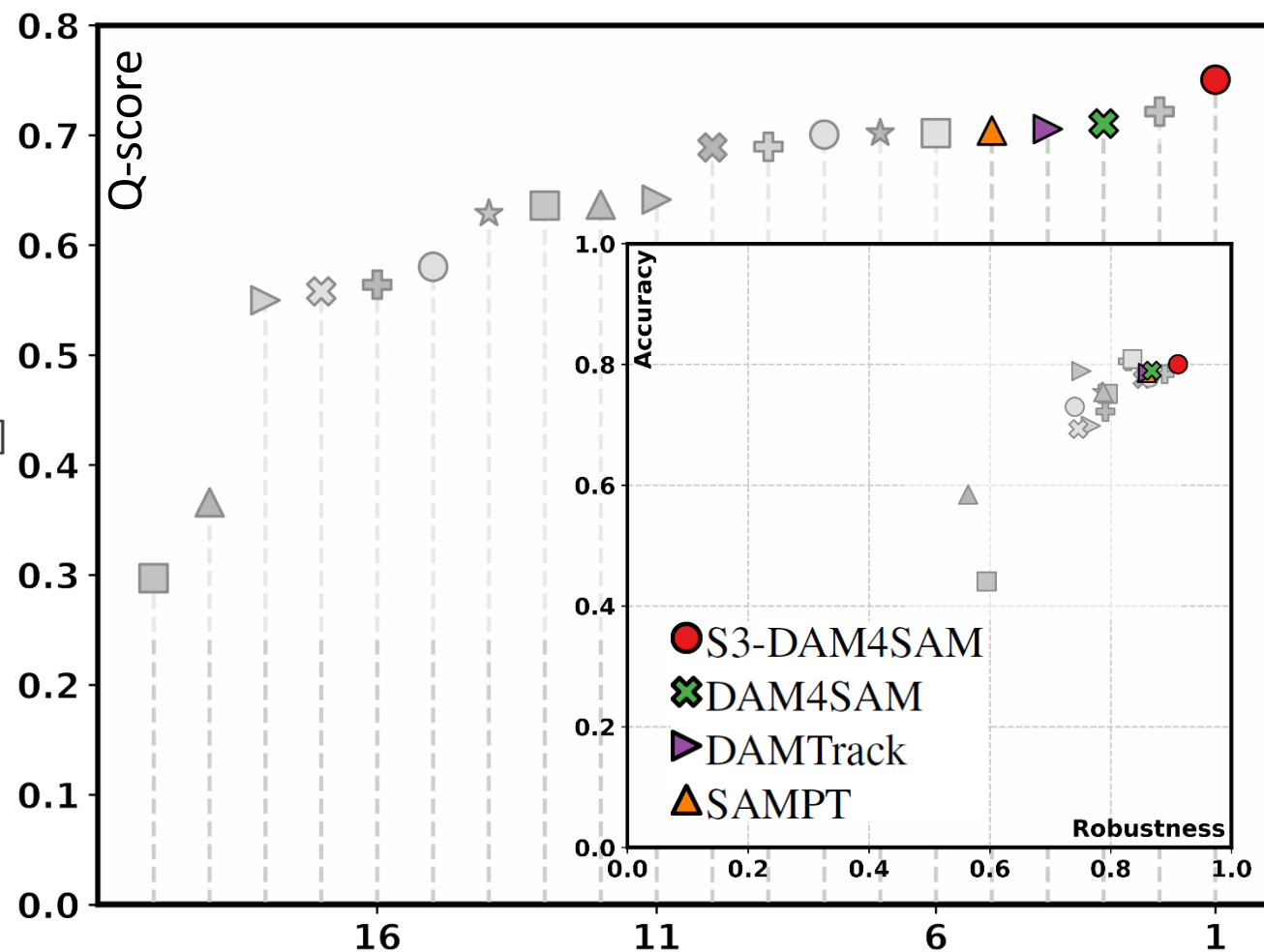
- Baseline 1: Independent STARKs^[1]
(100% outperform it)
- Baseline 2: VOT2022 winner MSAOT^[2]
(93% outperform it)
- Baseline 3: VOTS2023 winner DMAOT^[3]
(66% outperform it)
- Baseline 4: SAM2^[4]
(60% outperform it)
- Baseline 5: VOTS2024 winner S3_{TRACK}
(1 tracker outperforms it)



¹Yan, et al. ICCV2021; ²Yang, et al. NeurIPS 2021 ; ³Cheng, et al. VOTS 2023, ⁴Ravi, et al. ICRL 2025, ⁵Miao, et al. VOTS 2024

VOTS2025 challenge top 4 trackers

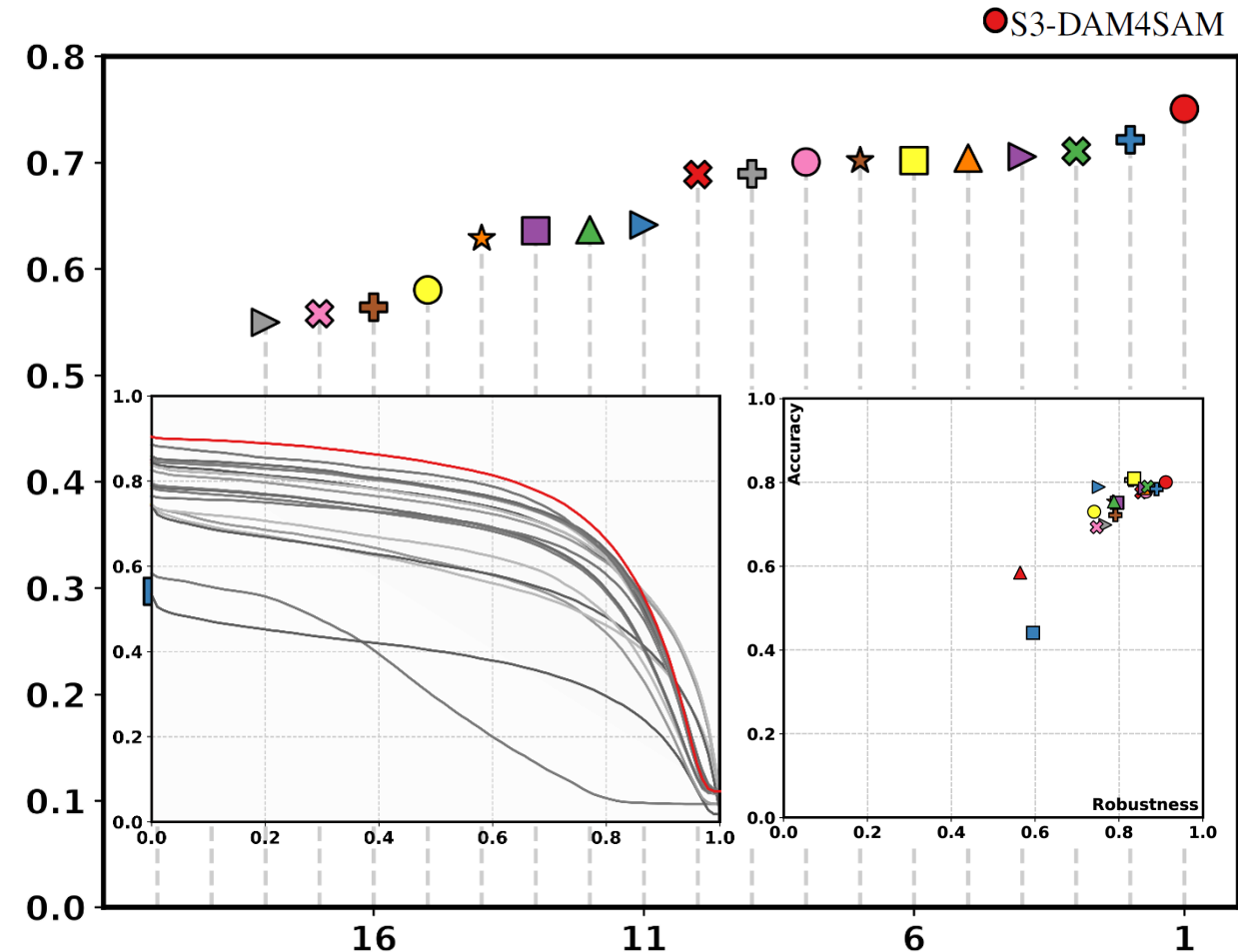
- Top 4 trackers (w.o. baselines): $S3_{DAM4SAM}$, DAM4SAM, DAM_{TRACK}, SAMPT
 - All memory-based VOS methods
 - All extend SAM2 / DAM4SAM
 - $S3_{DAM4SAM}$:
 - Extension of VOTS2024 winner $S3_{TRACK}^{[1]}$ + DAM4SAM^[2] + Cutie^[3]
 - DAM4SAM^[2]: a new memory for SAM2
 - DAM_{TRACK}: DMAOT^[4] + DAM4SAM^[2]
 - SAMPT: DAM4SAM^[2] + CoTracker^[5]



¹Miao et al. VOTS 2024; ²Videnović et al. CVPR2025; ³Cheng et al. CVPR2024; ⁴Cheng, et al. VOTS 2023; ⁵Karaev et al., ECCV2024

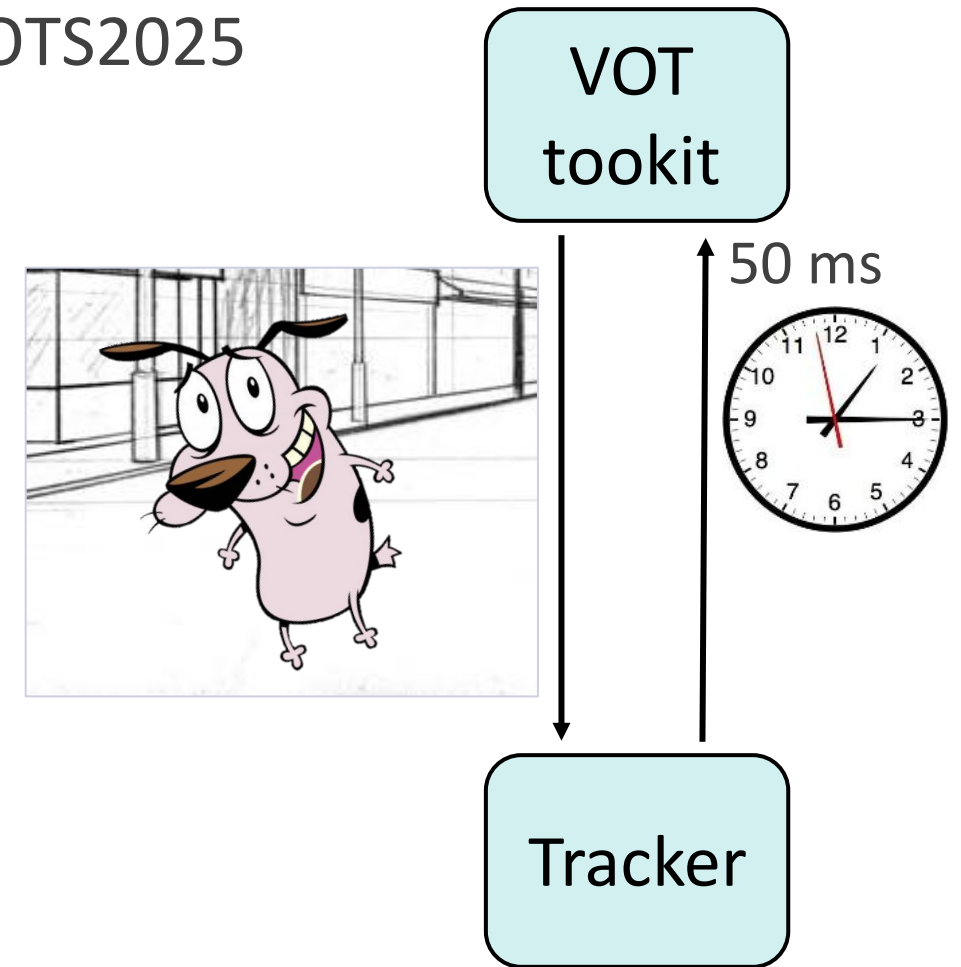
VOTS2025 top-ranked tracker S3_{DAM4SAM}

- *Q-score* = 0.751 (~6% improvement over second-best)
- VOTS aux measures: $A=0.8$, $R=0.911$, $DRE=0.04$, $NRE=0.045$, $ADQ=0.78$
- Good segmentation accuracy 80%, on-target in ~91% of frames
- Localization failure 9% due to:
 - Falsely reported target as absent: 51%
 - Drifting: 49%
- Accurately predicts target absence in 82% cases



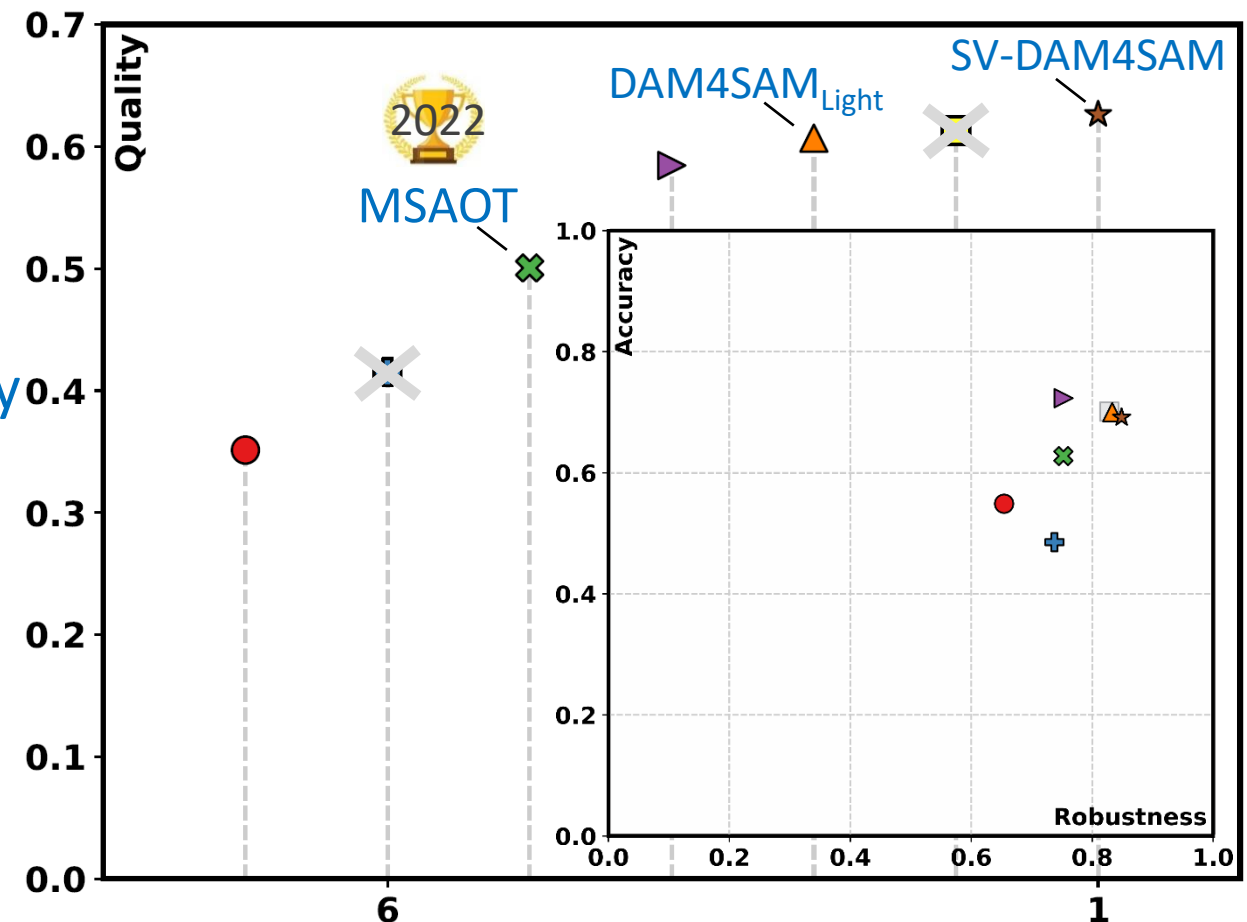
VOTS-RT2025 challenge

- Same performance evaluation protocol as VOTS2025
- Required to process sequences at **>20 fps**
- Each tracker **also run on VOTS2025**
- All tracker **re-run by the VOTS** committee
- **Same HW** for all trackers:
NVIDIA RTX 4500 Ada GPU with 24GB of VRAM
Intel i9-13900K CPU and 128GB of RAM
Debian 6.1.119 (OS), CUDA 12.4.0
- **Winner:** Tracker with **highest Q-score on the re-run** experiment



VOTS-RT2025 challenge results: 7 trackers tested

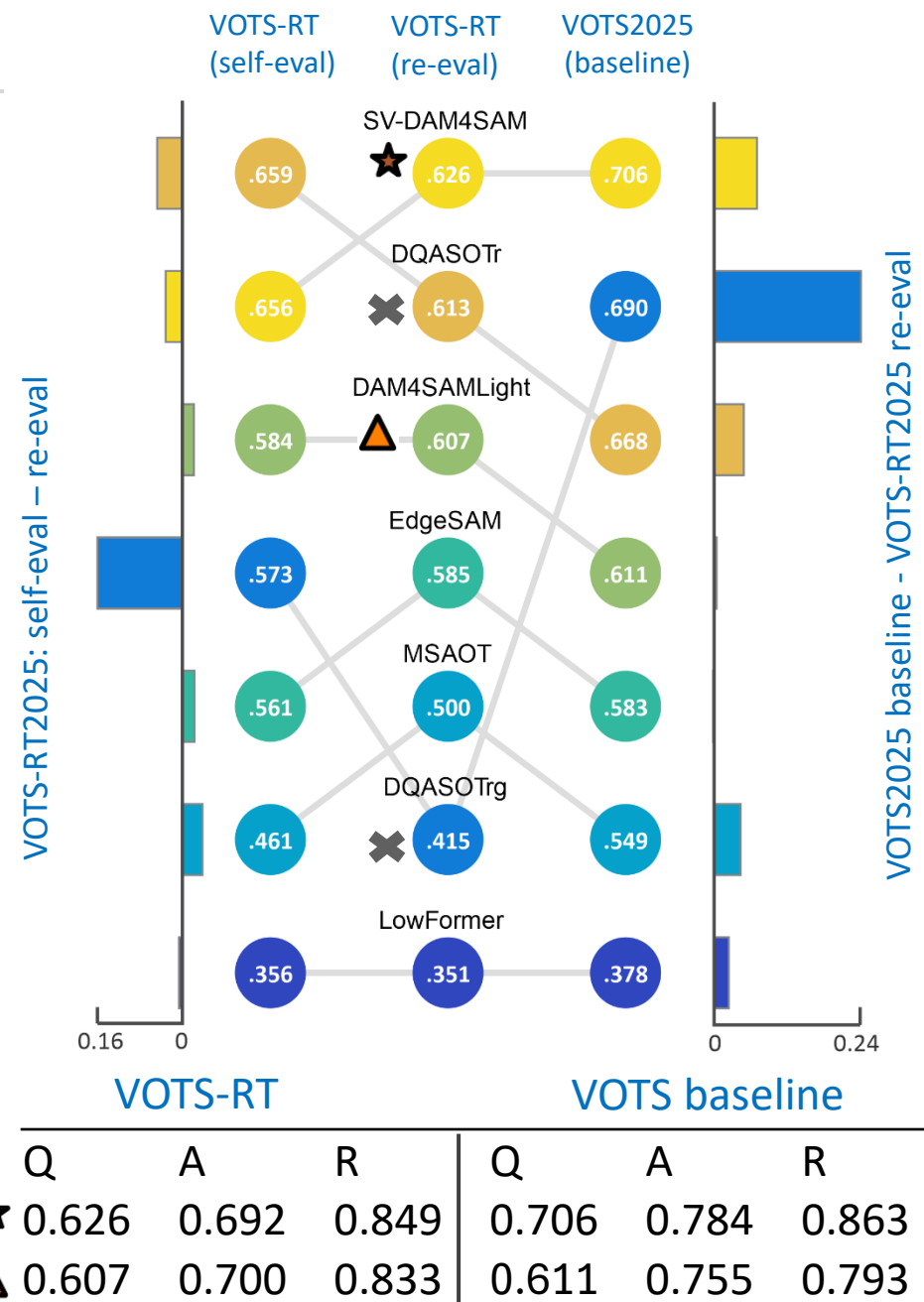
- Baseline: VOT-RT2022 winner MSAOT^[1] (4 outperform it)
- Two trackers impractical ✕
- Top 2: SV-DAM4SAM, DAM4SAM_{Light}
- SV-DAM4SAM:
 - DAM4SAM^[2] streamlined for efficiency
- DAM4SAM_{Light} :
 - DAM4SAM^[2] with Hiera-T^[3]



¹Yang, et al. NeurIPS 2021 ; ²Videnović et al. CVPR2025; ³Ravi, et al. ICRL 2025

VOTS-RT2025 vs VOTS2025

- Self-evaluation should be avoided in RT tracker evaluation
- ★ SV-DAM4SAM (Large): $Q_{\text{re-eval}} = 0.626$
 - 11% Q drop compared to VOTS2025
 - Primarily due to lower Accuracy (frame dropping)
- ▲ DAM4SAM_{Light} (Tiny): $Q_{\text{re-eval}} = 0.607$
 - 0.7% Q drop compared to VOTS2025
- DAM4SAM_{Light} **faster, BUT** SV-DAM4SAM **more robust** (i.e., tracks longer)
 - L-model* drops 10-20% more frames than *T-model*





VOTS2025 challenge

Winners:

S3-DAM4SAM by: [Deshui Miao](#), [Xin Li](#), [Zhenyu He](#),
[Yaowei Wang](#), [Ming-Hsuan Yang](#)

“Efficient spatial semantic trackers”



VOTS-RT2025 challenge

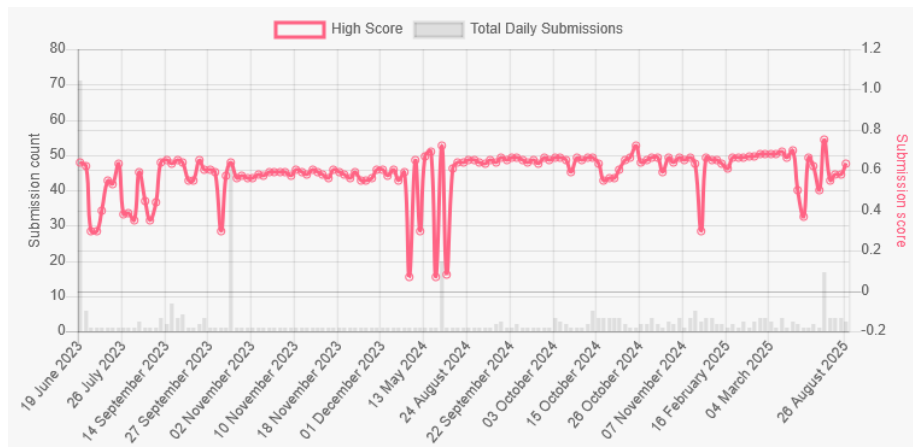
Winners:

SV-DAM4SAM by: [Deshui Miao](#), [Xingsen Huang](#), [Xin Li](#), [Qingfang Zheng](#),
[Ming-Hsuan Yang](#), [Yaowei Wang](#)

Winners talk next!

Summary

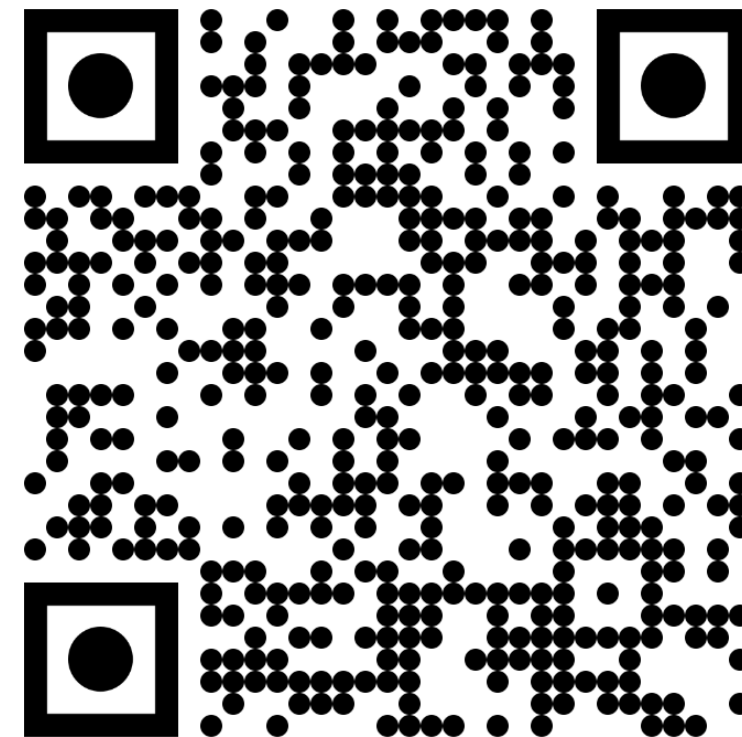
- Presented VOTS2025 & VOTS-RT2025 results
- Memory-based VOS architectures dominate (80% of submissions extend SAM2.1)
- Evaluation server re-opened (~100 trackers)



RESULTS									
#	User	Entries	Date of Last Entry	Q	Acc	Rob	NRE	DRE	ADQ
1	VOTS2025_S3-DAM4SAM	1	07/13/25	0.75 (1)	0.80 (7)	0.91 (1)	0.05 (37)	0.04 (94)	0.82 (7)
2	VOTS2024_S3_Track	5	10/23/24	0.72 (2)	0.78 (13)	0.89 (2)	0.07 (48)	0.04 (95)	0.78 (8)
3	VOTS2025_DAM4SAM	1	07/13/25	0.71 (3)	0.79 (9)	0.87 (4)	0.06 (53)	0.07 (82)	0.73 (22)
4	VOTS2025_DAMTrack	1	07/13/25	0.71 (4)	0.79 (12)	0.86 (6)	0.06 (52)	0.08 (74)	0.73 (23)
5	VOTS2025_SAMP1	1	07/13/25	0.70 (5)	0.79 (11)	0.86 (8)	0.06 (56)	0.08 (69)	0.72 (28)
6	VOTS2025_DQASOTg	1	07/13/25	0.70 (6)	0.81 (3)	0.84 (12)	0.08 (44)	0.08 (71)	0.76 (13)
7	VOTS2025_DQASOT	1	07/13/25	0.70 (7)	0.81 (2)	0.84 (11)	0.08 (45)	0.08 (70)	0.76 (14)
8	VOTS2025_DAM4SAM2-SAM1	1	07/13/25	0.70 (8)	0.78 (16)	0.86 (5)	0.06 (54)	0.08 (79)	0.73 (24)
9	dmaot_VOTS	38	04/07/25	0.70 (9)	0.81 (1)	0.83 (14)	0.09 (43)	0.08 (72)	0.77 (10)
10	VOTS2025_DQASOTb	1	07/13/25	0.69 (10)	0.81 (5)	0.83 (13)	0.09 (41)	0.08 (76)	0.72 (26)
11	hello_world	54	04/01/25	0.68 (11)	0.81 (4)	0.81 (16)	0.11 (37)	0.08 (77)	0.77 (9)
12	civa_	1	09/20/24	0.66 (12)	0.78 (17)	0.80 (19)	0.14 (32)	0.06 (88)	0.76 (15)
13	civa_lab_	2	09/18/24	0.65 (13)	0.79 (10)	0.79 (22)	0.14 (28)	0.07 (85)	0.72 (29)
14	VOTS2024_dmaot_sam	1	07/08/24	0.65 (14)	0.79 (8)	0.78 (20)	0.14 (25)	0.08 (75)	0.73 (19)
15	vincenzomariano.s	5	03/05/24	0.65 (15)	0.77 (20)	0.80 (18)	0.14 (26)	0.06 (89)	0.76 (12)
16	civa_lab_3_	9	09/20/24	0.64 (16)	0.76 (22)	0.79 (27)	0.14 (24)	0.07 (84)	0.77 (11)
17	VOTS2024_HQ-OMAOT	1	07/08/24	0.64 (17)	0.75 (26)	0.79 (23)	0.14 (33)	0.07 (81)	0.75 (16)
18	VOTS2025_HQ-OMAOT	1	07/13/25	0.64 (18)	0.75 (27)	0.79 (25)	0.14 (29)	0.07 (80)	0.75 (17)
19	sfaefaeccv	5	08/09/24	0.64 (19)	0.78 (14)	0.75 (44)	0.19 (14)	0.06 (90)	0.82 (5)
20	VOTS2023_DMAOT	2	10/17/23	0.64 (20)	0.75 (32)	0.80 (20)	0.14 (31)	0.07 (86)	0.73 (20)
21	VOTS2024_LY-SAM	1	07/08/24	0.63 (21)	0.77 (21)	0.78 (31)	0.14 (27)	0.08 (88)	0.72 (27)
22	VOTS2025_DMAOT_TTA	1	07/13/25	0.63 (22)	0.75 (25)	0.78 (28)	0.14 (30)	0.08 (78)	0.72 (25)
23	jimzhou	1	06/23/25	0.62 (23)	0.75 (34)	0.79 (26)	0.13 (35)	0.08 (86)	0.60 (39)
24	VOTS2023_HQTrack	3	10/17/23	0.62 (24)	0.75 (30)	0.77 (36)	0.15 (23)	0.08 (73)	0.69 (32)



VOTS2025 benchmark



Thanks

- The VOTS2025 committee



M. Kristan



J. Matas



P. Tokmakov



A. Lukežič



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Xuan-Son Vu



Johanna Björklund



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H. J. Chang



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- VOTS2025 sponsors:

