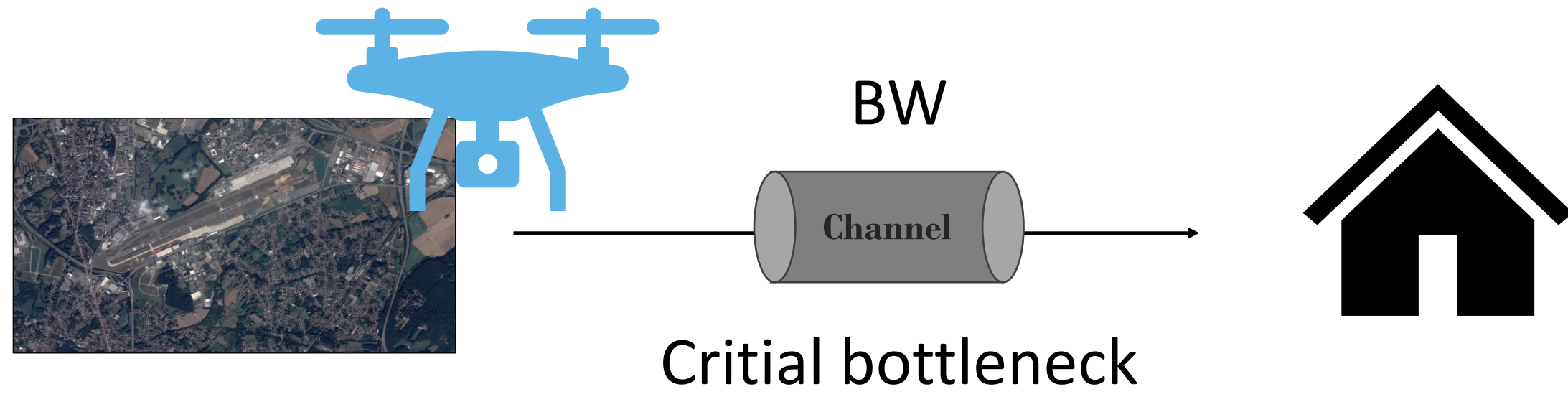


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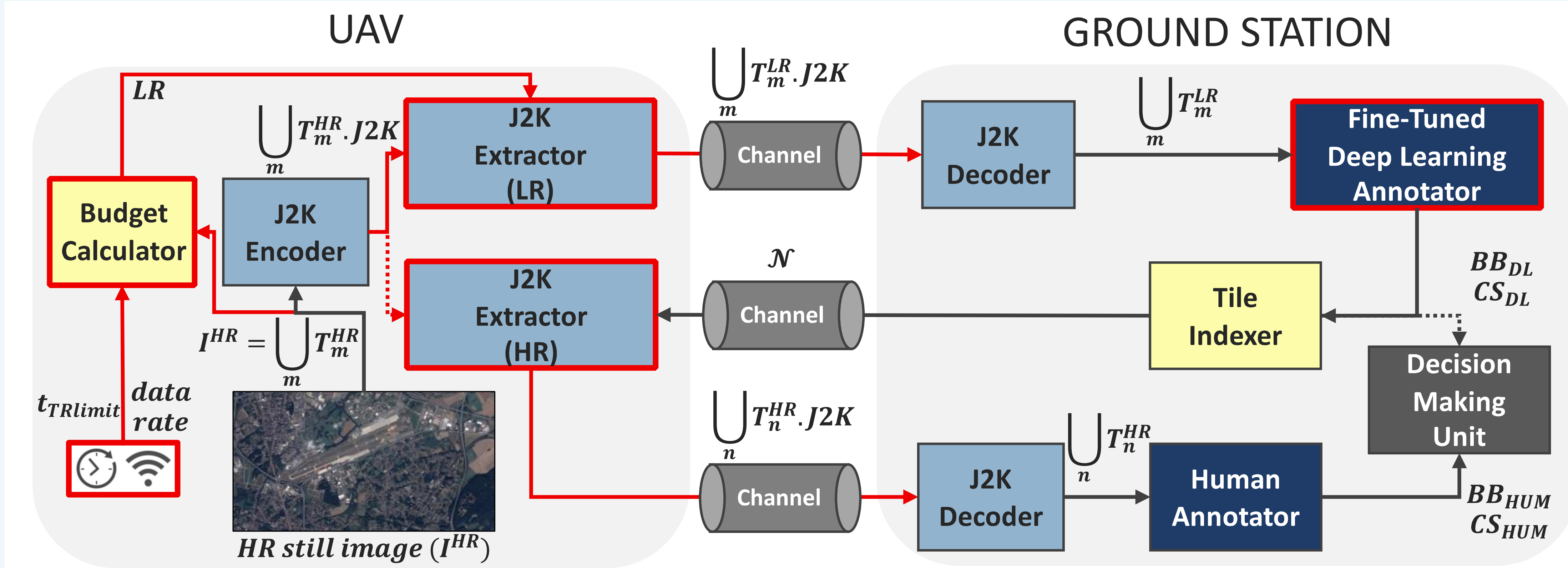
1. CONTEXT: UAVs are essential in emergency scenarios



2 challenges for decision-making:
Fast transmission and annotation
→ Use of **multiresolution** and **hybrid annotation**
to allow **fast** and **accurate** decisions
while **saving expert time**



2. METHOD: Proposed approach



3 improvements:

- **Scenario constraints are integrated** to determine the highest available resolution LR instead of HR (**baseline**)
- Only **tiles selected for human annotator** are sent in **HR**
- DL models are fine-tuned at different resolution levels

3. EXPERIMENTAL SETUP: Application on satellite images of airports with aircrafts

- 165 HR images (60 MP)
- Fine-tuned Yolov8 on 5 resolutions levels
- 📶 BW fixed : 176, 88 and 22 kbps
- 🕒 Level of emergency fixed, determined by $t_{RSlimit}$: 3, 10 and 30 min
- 2 metrics to compare the **proposed** approach to the **baseline** : t_{RS_ratio} and **recall_diff**

	3	10	30
176	0.257 7.08	0.112 3.67	0.028 1.54
88	0.35 25.44	0.148 7.27	0.028 2.95
22	/	0.359 34.4	0.115 11.28

4. RESULTS: Response time is reduced by a factor of 34

176 kbps:

Proposed transmits LR tiles LR

→ Improvement of t_{RS_ratio}

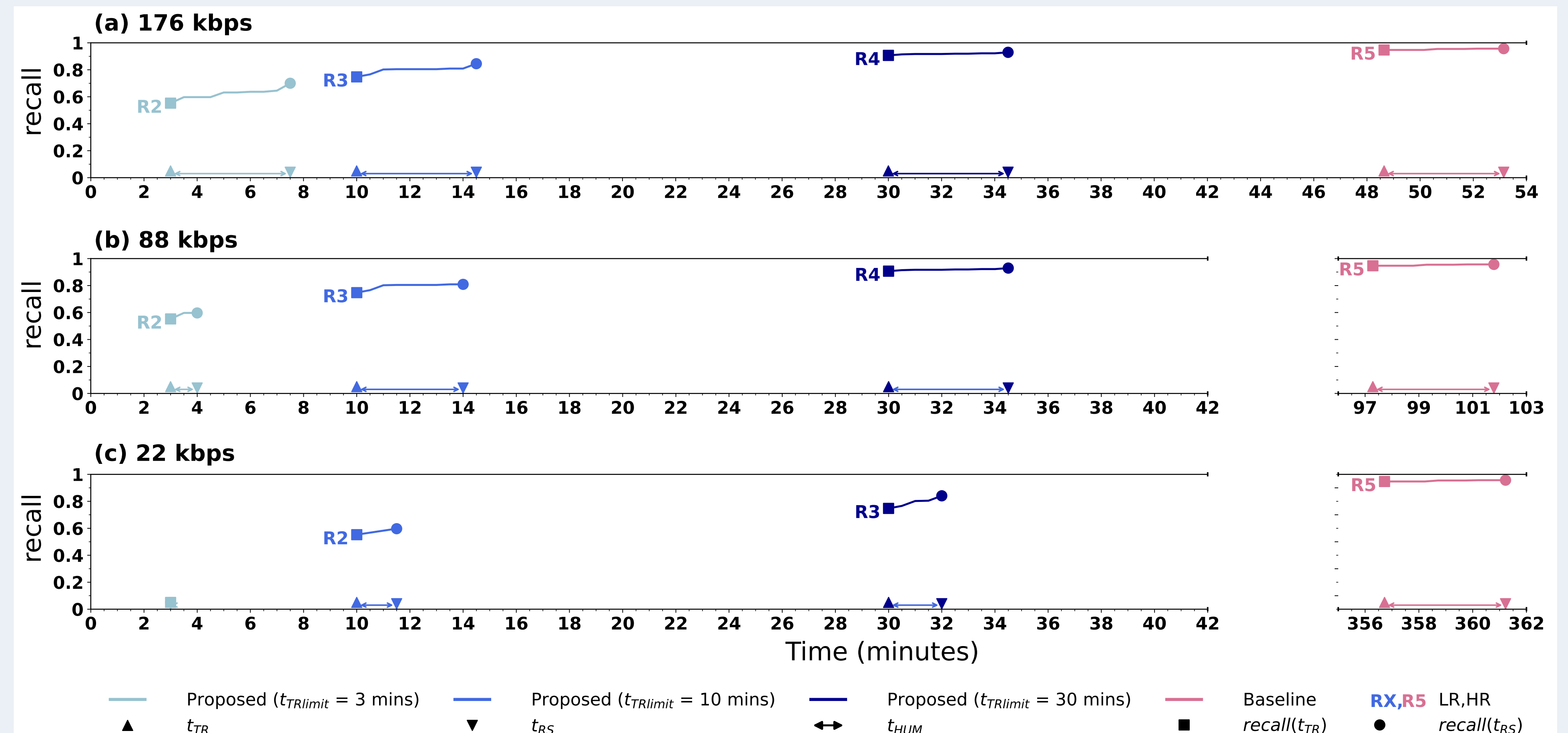
Baseline always transmits HR tiles → Penalty in **recall_diff** because performance of fine-tuned model at HR is better

88 kbps:

Higher improvement of t_{RS_ratio} and lower decrease of **recall_diff** because budget for human annotation is lower

22 kbps:

Highest gain in t_{RS} . However, at 3min, even the lowest LR cannot be sent because the BW is too restrictive



Key References

- [1] Preethy Byju, et al., "Remote-sensing image scene classification with deep neural networks in jpeg 2000 compressed domain," IEEE Transactions on Geoscience and Remote Sensing, vol. 59, no. 4, pp. 3458-3472, 2021.
- [2] El Khoury, et al., "Improved 3d u-net robustness against jpeg 2000 compression for male pelvic organ segmentation in radiotherapy," Journal of Medical Imaging, vol. 8, no. 04, 2021.
- [3] El Khoury, et al., "Improving 3d lesion segmentation robustness against image compression in multiple sclerosis," in 2024 IEEE International Symposium on Biomedical Imaging, 2024, p. 1.
- [4] Yamani, et al., "Active learning for single-stage object detection in uav images," in Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), January 2024, pp. 1860-1869.
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5. CONCLUSION

The combination of fine-tuned DL model and human annotation with multiresolution allows to speed up the decision-making process in BW limited scenarios, up to 34 times in the most restrictive case
FUTURE WORKS will focus on optimizing each component of the framework (fine-tuning of the model and tile selection strategy for human annotation)

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*Denotes equal contribution