Uncertainty in
Recurrent Decision Tree Classifiers

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Explainable Machine Learning

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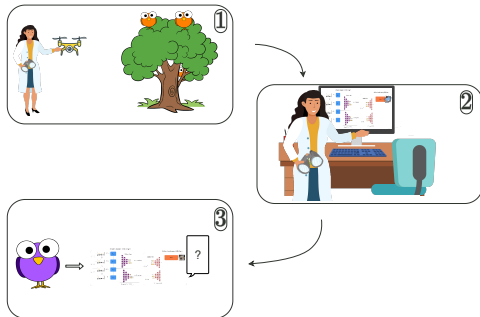
- There are a lot of architectures that perform great on image classification tasks

- Maybe, most prominently: ResNet

- However, they only yield a classification

- In many settings a classification is not worth much without the reasoning behind it

- The ornithologist is tasked to survey bird species, which she automates using a drone and computer vision software

- She uses our model to go through the vast amount of collected data

- Some bird species unknown to the model appear in the data. The model yields high uncertainty and the ornithologist can classify them manually
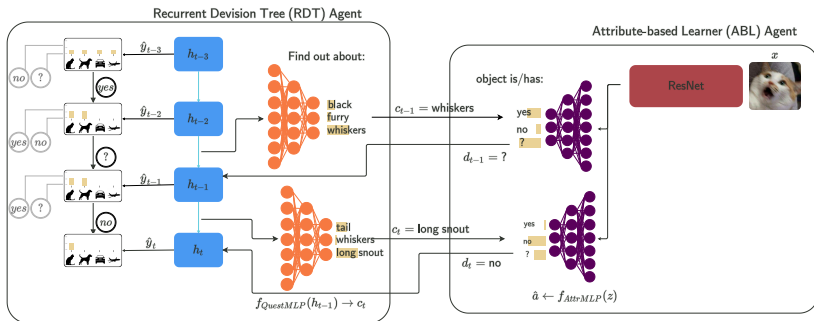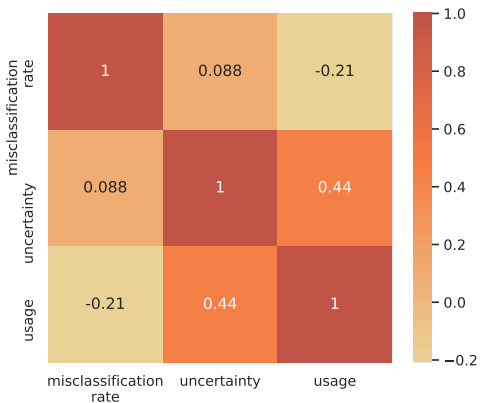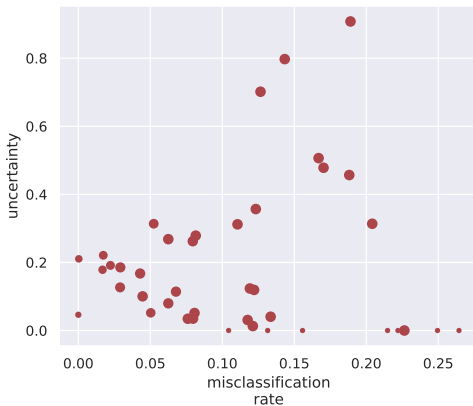
Recurrent Devision Tree (RDT) Agent

Attribute-based Learner (ABL) Agent
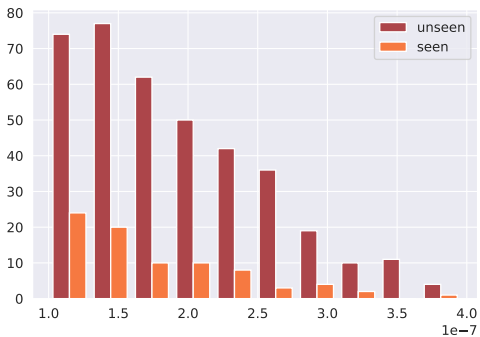
	AWA2	aPY	CUB
ResNet [HZRS16]	98.2 ± 0.0	85.1 ± 0.6	79.0 ± 0.2
DT	78.0 ± 0.4	64.3 ± 0.6	19.3 ± 0.3
dNDF[KFCRB15]	97.6 ± 0.2	85.0 ± 0.6	73.8 ± 0.3
RDTC[AA19]	98.0 ± 0.1	85.7 ± 0.7	78.1 ± 0.2
XDT	73.9 ± 0.9	59.9 ± 1.5	4.9 ± 1.3
aRDTC[AA19]	98.6	86.1	77.9 ± 0.6
remRDTC(ours)	98.7	86.4	77.7
extRDTC(ours)	98.7	85.4	77.8

	aRDTC [AA19]	Random Baseline	remRDTC	extRDTC
AWA2				
Class	98.6	98.5	98.7	98.7
Attribute	80.4	84.6	87.5	82.31
aPY				
Class	86.1	86.5	86.4	85.4
Attribute	86.4	86.2	87.6	87.12
CUB				
Class	77.9	76.8	77.7	77.8
Attribute	68.6	70.0	77.4	82.6

[AA19] Stephan Alaniz and Zeynep Akata. Explainable observer-classifier for explainable binary decisions. arXiv preprint arXiv:1902.01780, 2019.

[HZRS16] Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Deep residual learning for image recognition. In Proceedings of the IEEE conference on computer vision and pattern recognition, pages 770–778, 2016.

[KFCRB15] Peter Kontschieder, Madalina Fiterau, Antonio Criminisi, and Samuel Rota Bulo. Deep neural decision forests. In Proceedings of the IEEE international conference on computer vision, pages 1467–1475, 2015.