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One-Shot Meta-Interpretive Learning from Real Images

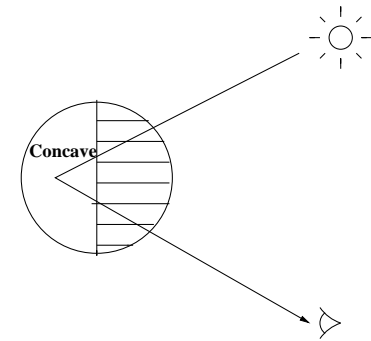
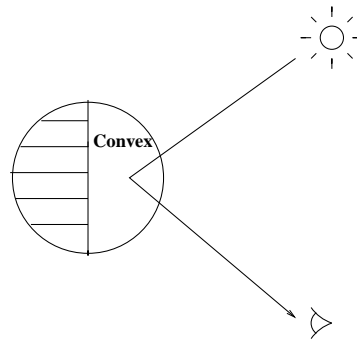
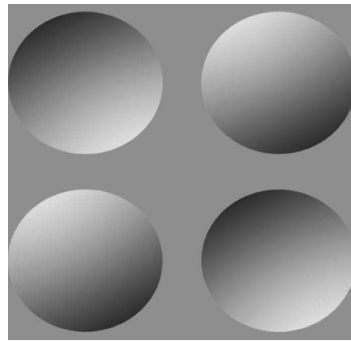
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Motivation

- Meta-Interpretive Learning [Muggleton et al, 2015]
- Logical Vision 1 [Dai et al, 2015] Visual recognition of 2D polygon classes **Artificial images** , noise-free
- Logical Vision 2 Recognition of 3D shapes, **Real images**, noisy, ambiguous
- Small sample learning
- **Generic background knowledge** about light rays

Learnable background - light rays

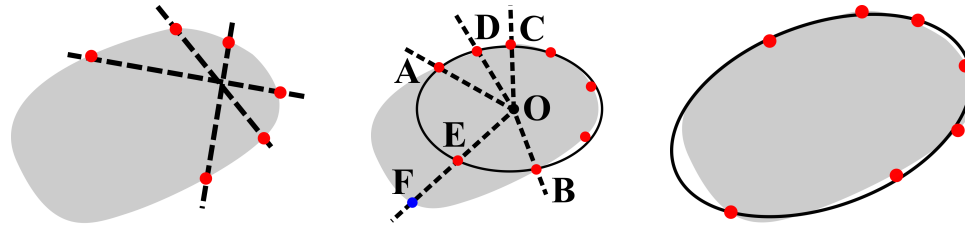


$light(X, X).$

$light(X, Y) : \text{--reflect}(X, Z), light(Z, Y).$

LogVis algorithm

Object detection

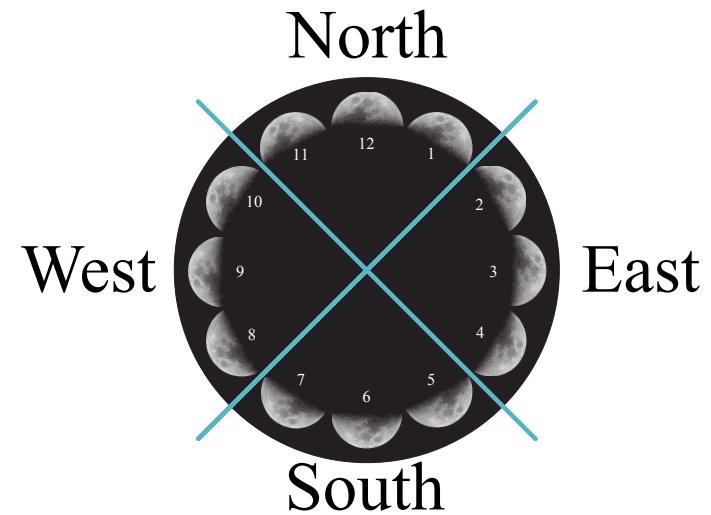
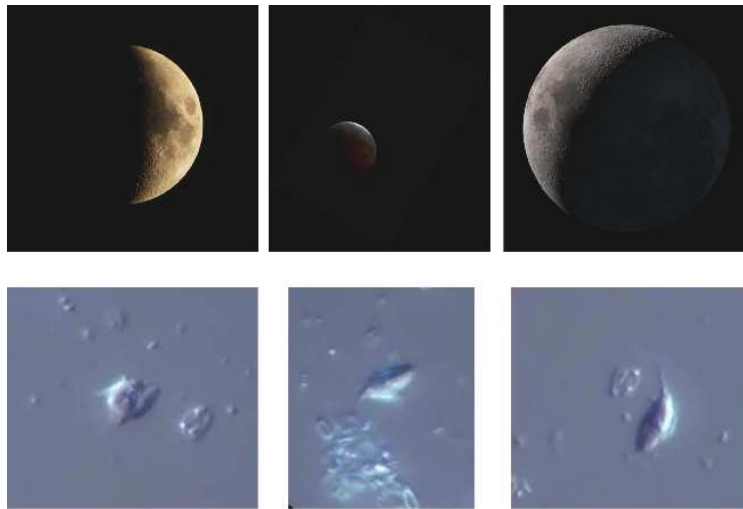


Metagol with Background knowledge

light_source_angle/3
opposite_angle/2

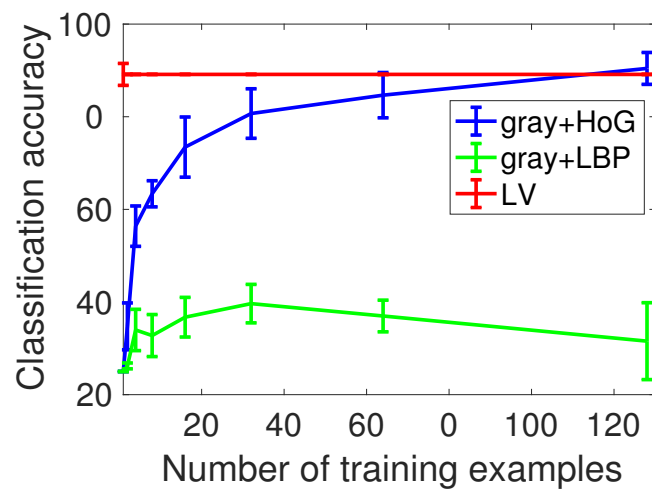
Experiments 1+2

Moon and Protist data

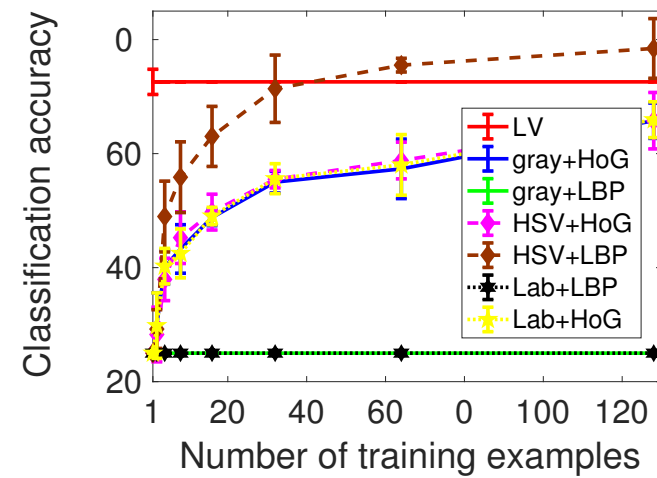


Expt 1+2 - LogVis (1-shot) versus Statistical Classifier (30-shot)

Results Experiments 1 and 2

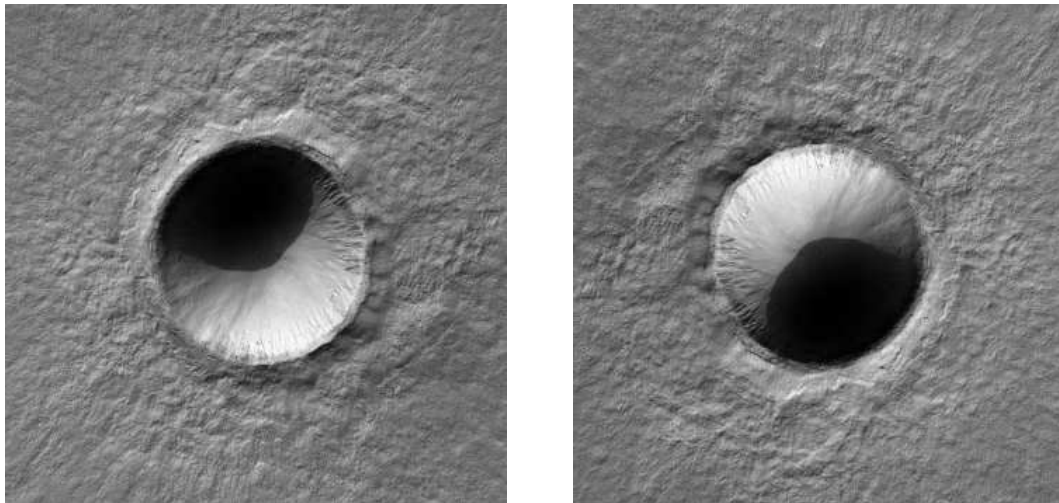


Moons



Protists

Learning ambiguity



Ambiguity test - abduction on learned program

Conclusions

- Humans learn from **single images** [Lake et al, 2011]
- Requires generic background knowledge about **light**
- Value in **scientific image interpretation**
- **Galileo** [1610] - telescopic observations of Moon
- **Hooke** [1665] - microscopic observations of micro-organisms
- Further work - **Movie sequences**

Bibliography

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