

Automatic Detection of Cognitive Load from Pupil Dilation in Real world Scenarios

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We are focusing on pupil dilation

We attempt to maximize the informativeness of the pupil dilation
(improve just one important feature of eye-tracker data)

We want to observe cognitive load at any point in time
(to present a continuous cognitive effort, not just the summaries for each task)

We want to observe cognitive load independently of the displayed interface
(enable testing of dynamic colorful interfaces)

After a large number of experiments

We proposed pupil reactions model (PRM) and appropriate calibration procedure(s)

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The model consists of four parts (QRC, RPM, ELum, UCP)

1. Quadratic reference curve (luminosity => diameter)
2. Retinal projection matrix (pixel distance => luminosity)
3. Environment luminosity (effect of environment)
4. Unique color perception (pixel color => luminosity)
5. Reaction delay, reaction speed ...

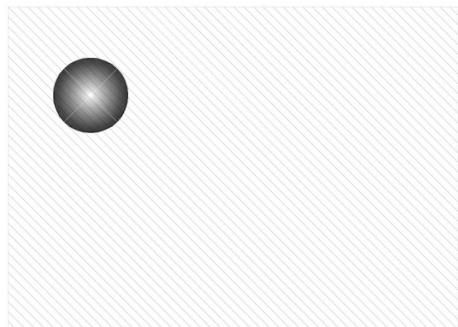
Quadratic reference curve



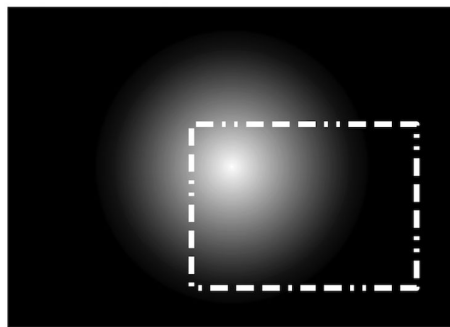
a value: 0.40506
b value: -1.30468
c value: 3.85687

bright: 2.957
dark: 3.857

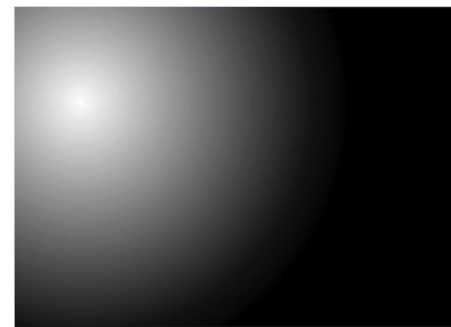
Retinal projection matrix



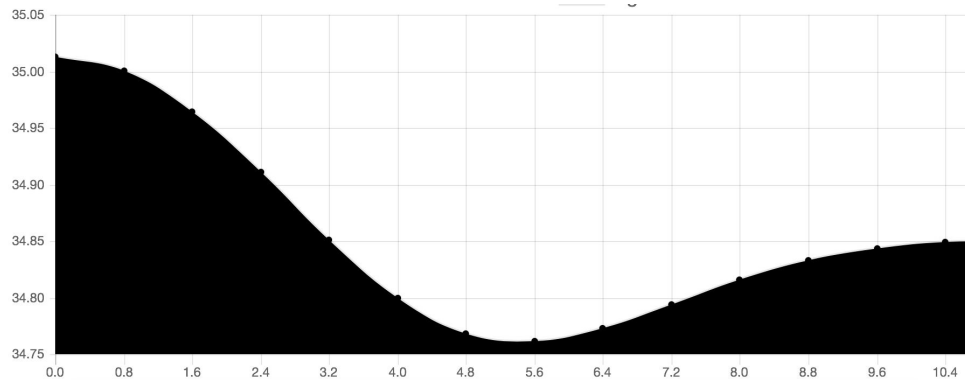
Fixation in stimulus



RPM selecting



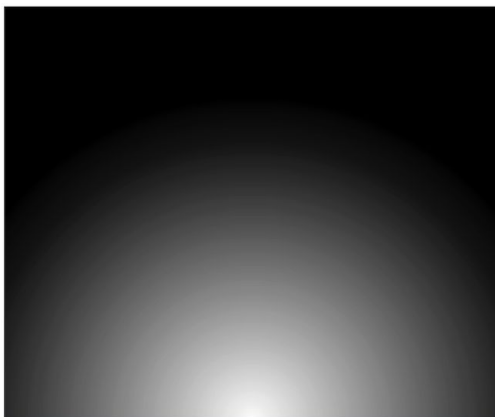
Final RPM



Environment luminosity



Fixation [x=0, y=0]



Fixation [x=0, y=1]



Fixation [x=1, y=1]

RPM density



High



Medium



Minimal

Unique color perception

#000000

#ffff00

#ff00ff

#0000ff

#00ffff

P1

#000000

#ffff00

#ff00ff

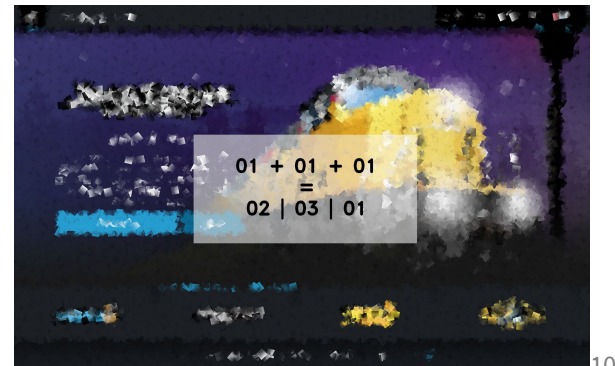
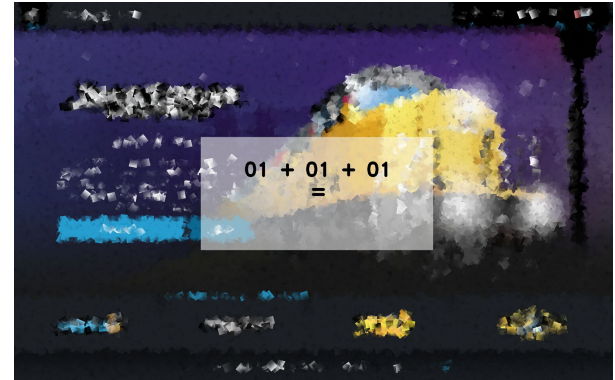
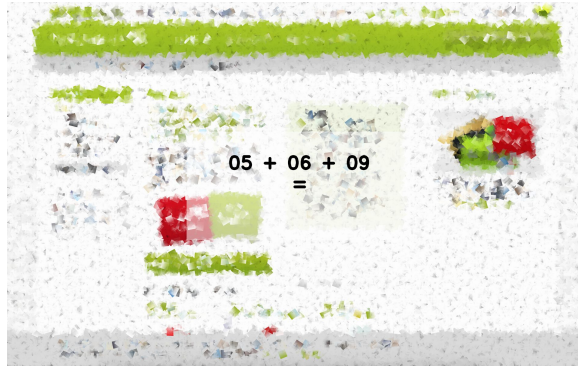
#0000ff

#00ffff

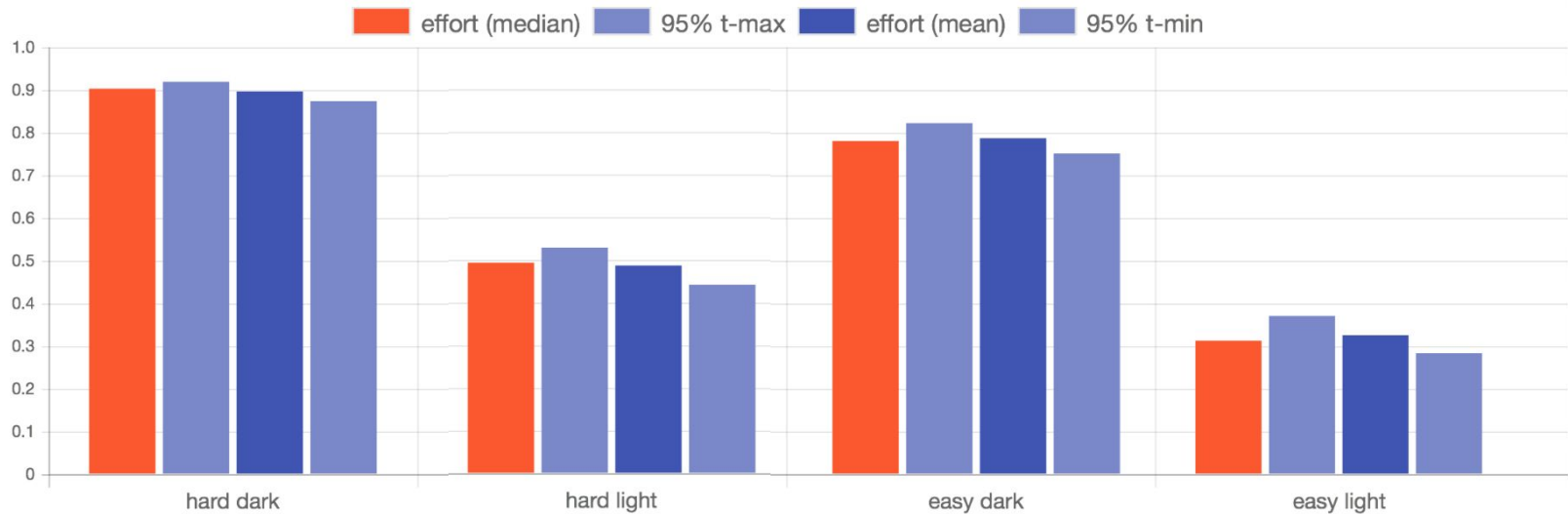
P2

Final experiment

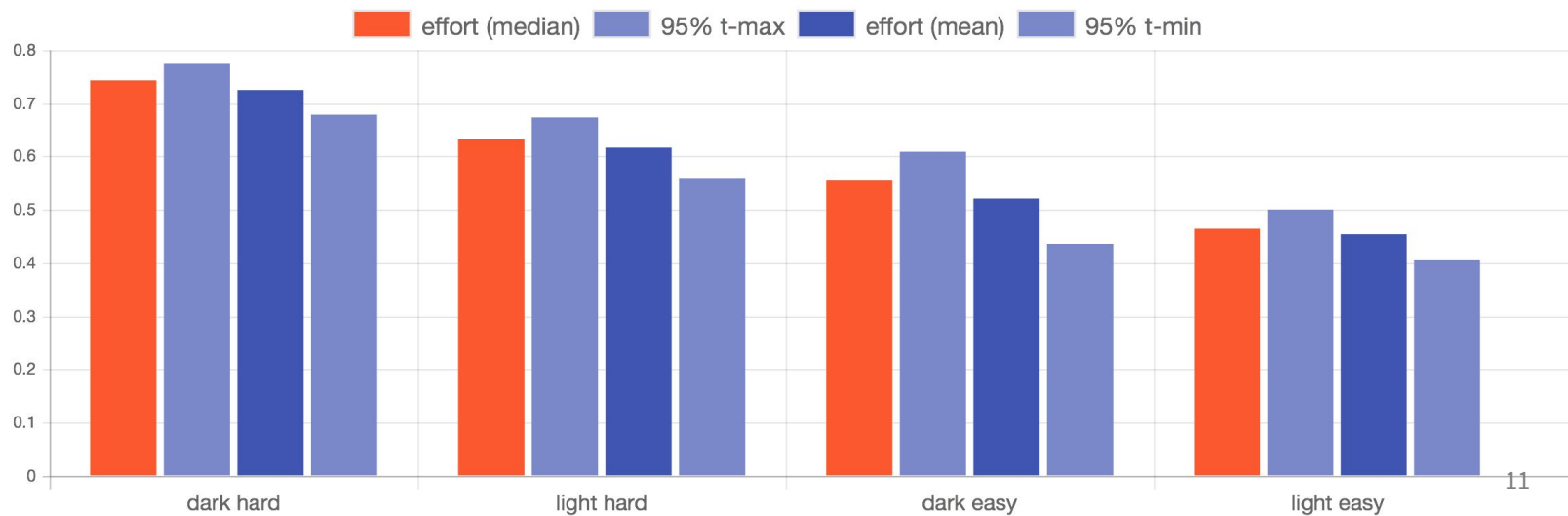
(each web (3) x each lum level (4) x each task level (3) x both placements (2))



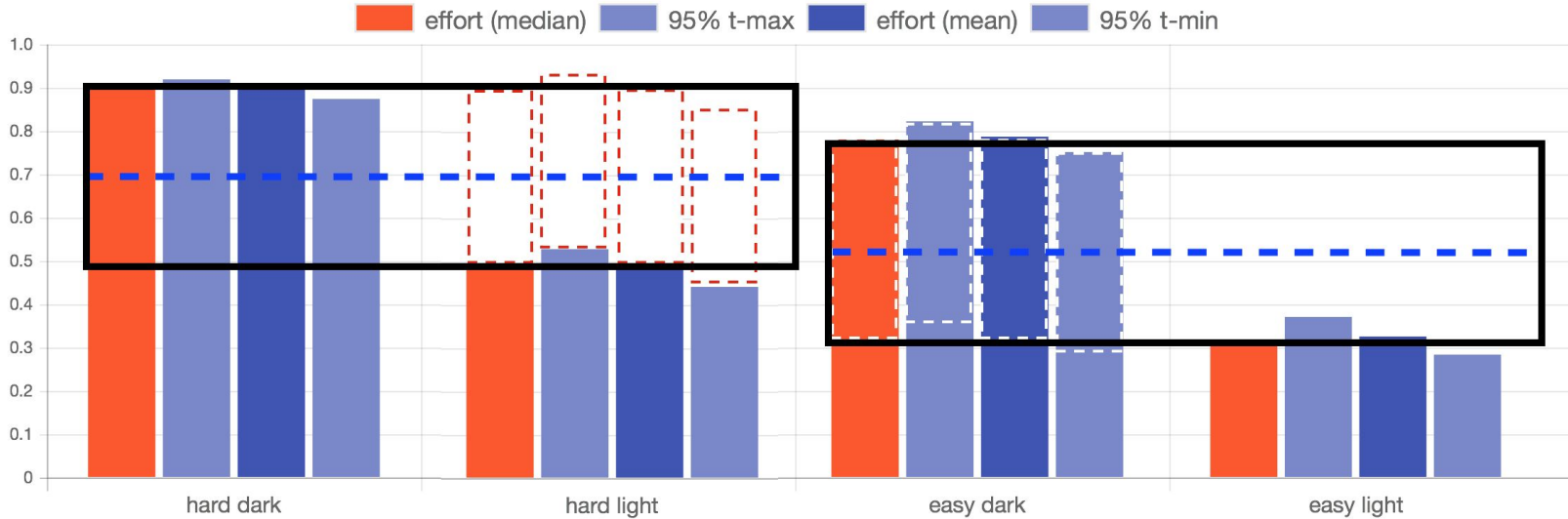
**Ignore
Luminosity**



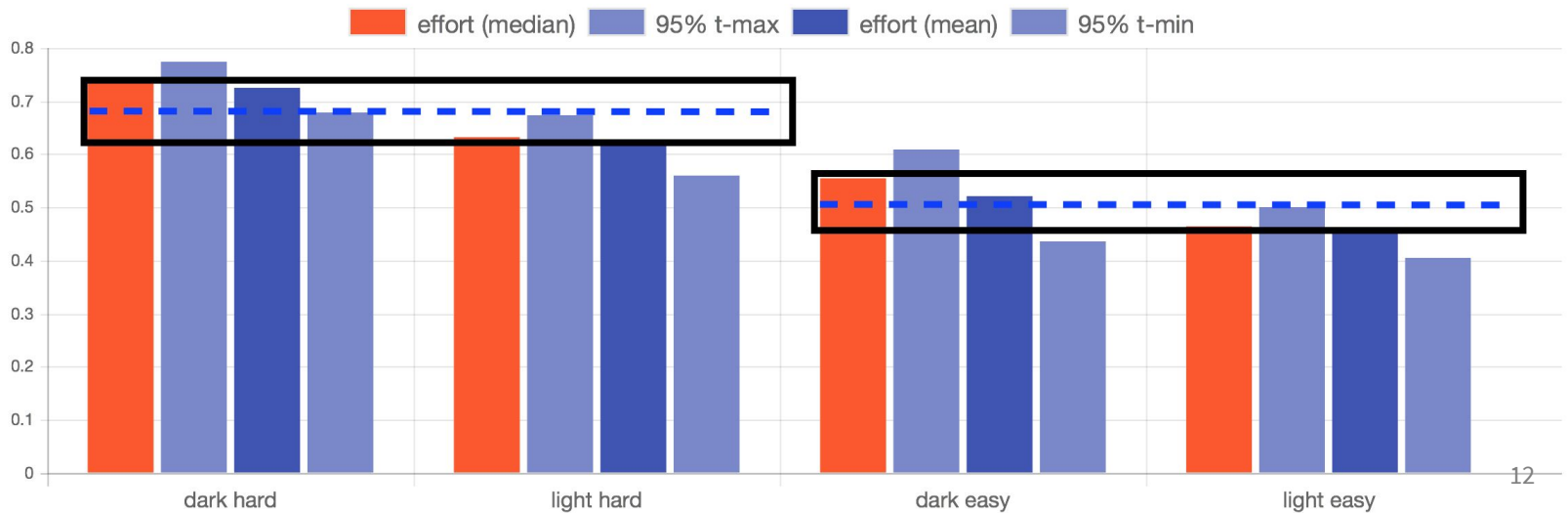
**Proposed
Method**



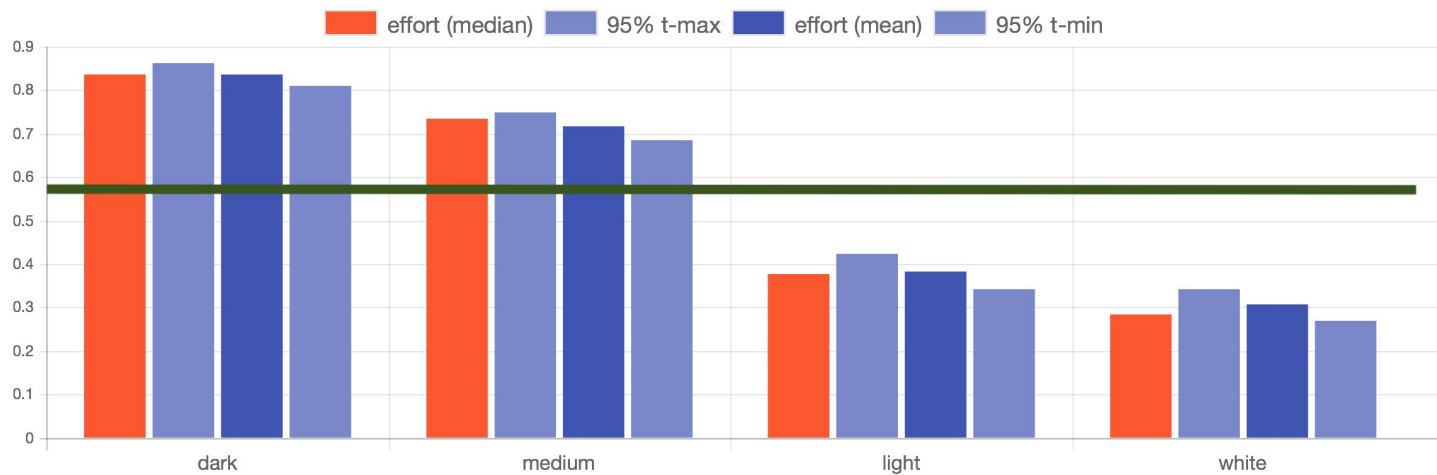
Ignore
Luminosity



Proposed
Method



**Ignore
Luminosity**



**Proposed
Method**

