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Multi-camera Iris Quality Study

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Agenda

- Iris recognition overview
- Study outline
- Results and Analysis
- Conclusions

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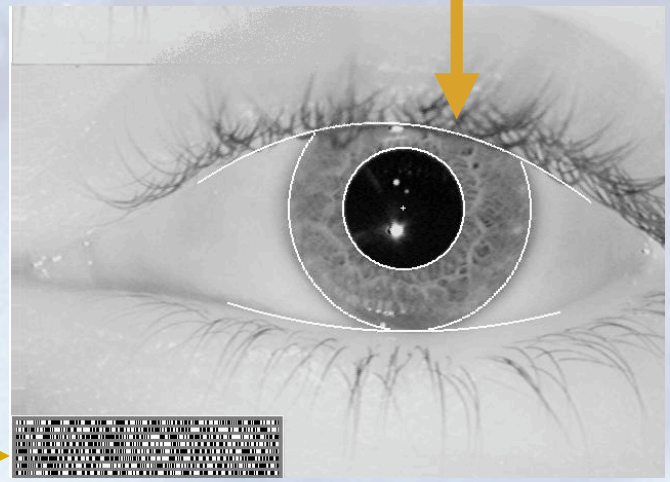
Iris Template Generation and Matching

1. Capture a digital image of the iris

2. Prepare, process image for analysis



3. Create 688 byte IrisCode® from iris texture/ patterns

4. Use IrisCode® template for Authentication

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Iris Match Metrics

- Templates are fixed-length but have variable number of "usable" bits
- Hamming Distance used as match metric
  - HDraw = differing bits/usable bits
- Authentication uses "HDnorm" – HDraw adjusted to account for change in imposter statistics if entire iris is not visible

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Study Outline

- Six different Iridian-certified iris cameras
  - Single-eye desktop (DT) (3)
  - Single-eye walk-up (SE) (1)
  - Two-eye walk-up (TE) (2)
- 47 subjects
- Enrollment then recognition, each camera
- Same enrollment criteria, all cameras
- Evaluate recognition images and calculate metrics for authentic matches

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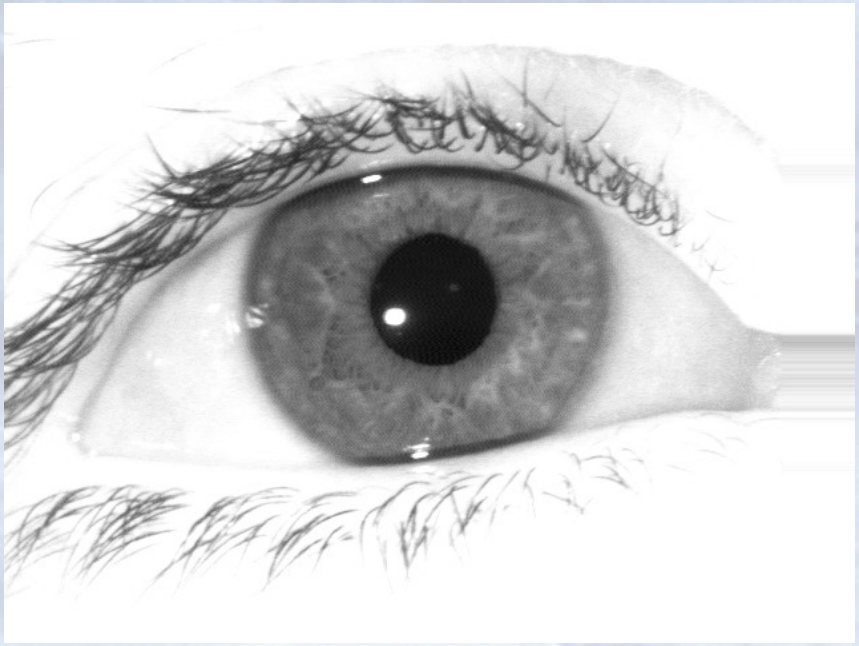
Iris Quality Metrics

- Iris radius
- Pupil radius
- Pupil-iris ratio
- Iris-sclera contrast
- Iris intensity
- Texture energy
- Visible iris



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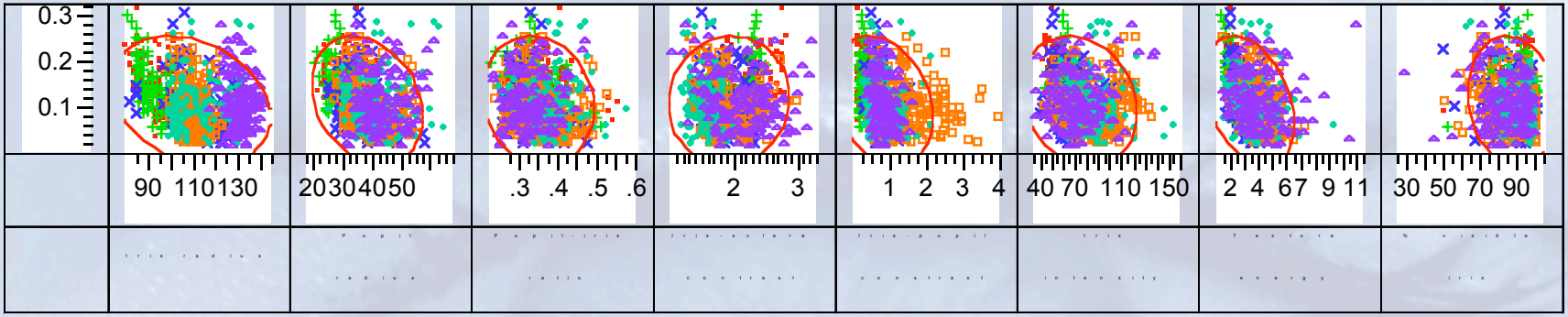
Correlation of HDraw with all metrics



Camera
- DT
- DT
- TE
- SE
- DT
- TE

NOTE:

Iris-sclera contrast is not significantly correlated with HDraw

Pupil radius and iris radius are highly correlated

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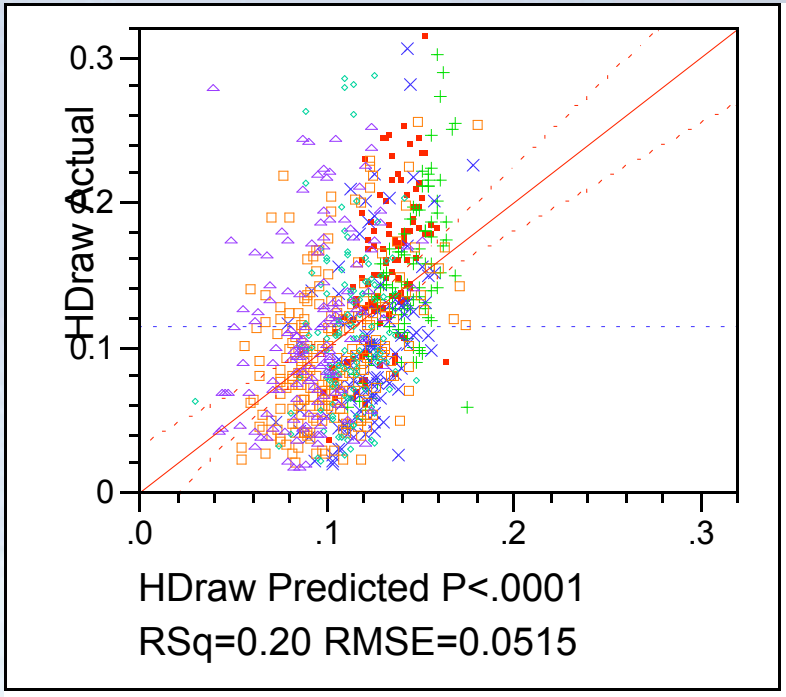
Multivariate Regression



Construct a function to predict HDraw from quality metrics:

$$Y = a_1x_1 + a_2x_2 + a_3x_3 + \ldots + b$$

The predictive value of each metric is reflected in the magnitude of the t-ratios associated with the estimates for the weights a_i:

Texture energy	*-6.67*
% visible iris	*-6.12*
Iris radius	*-4.56*
Iris-pupil contrast	*-3.61*
Iris intensity	*2.88*
*Pupil-iris ratio**	*-1.32*

**not significant, p-value > 0.05*

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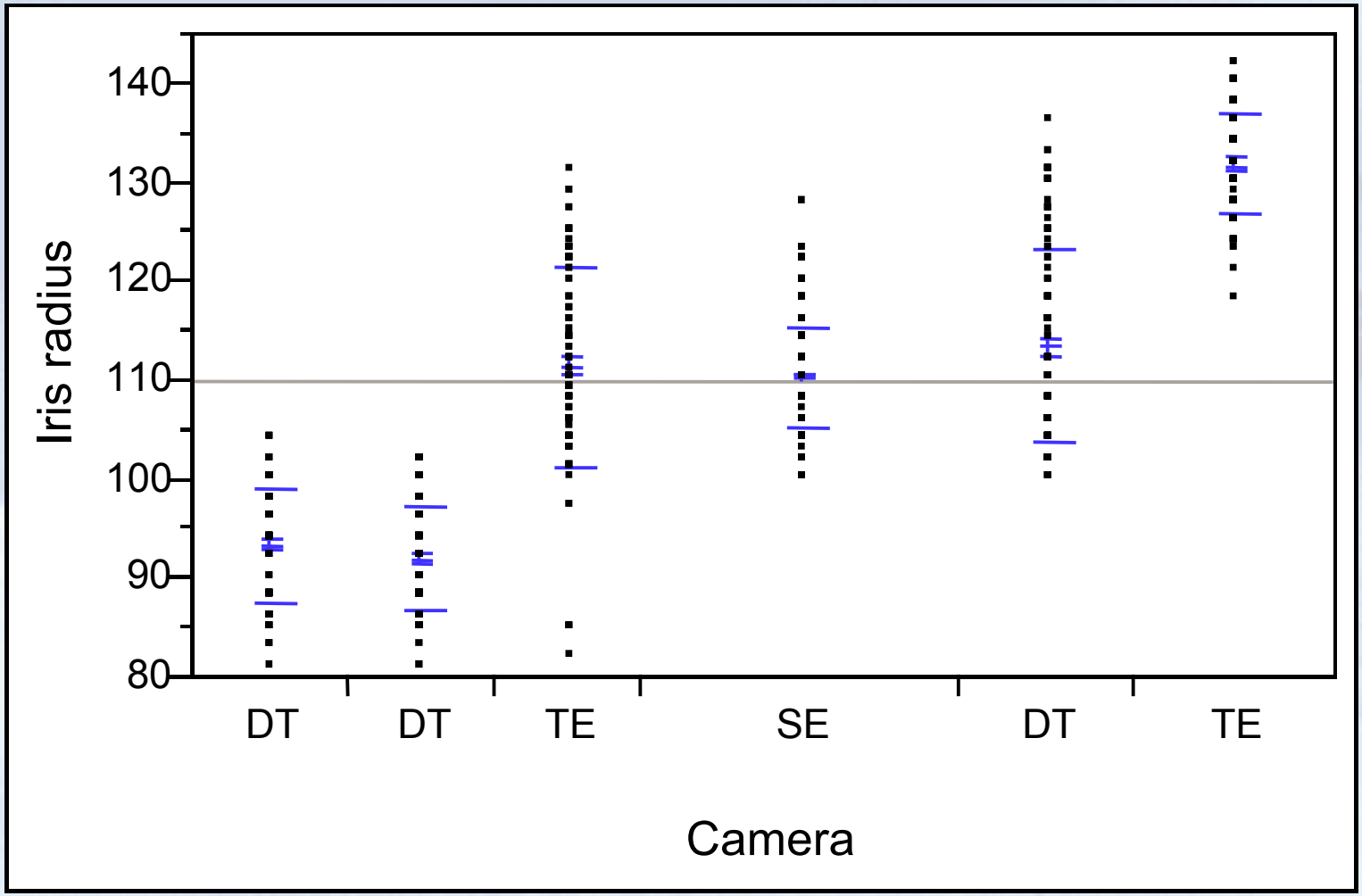
Iris Radius by Camera



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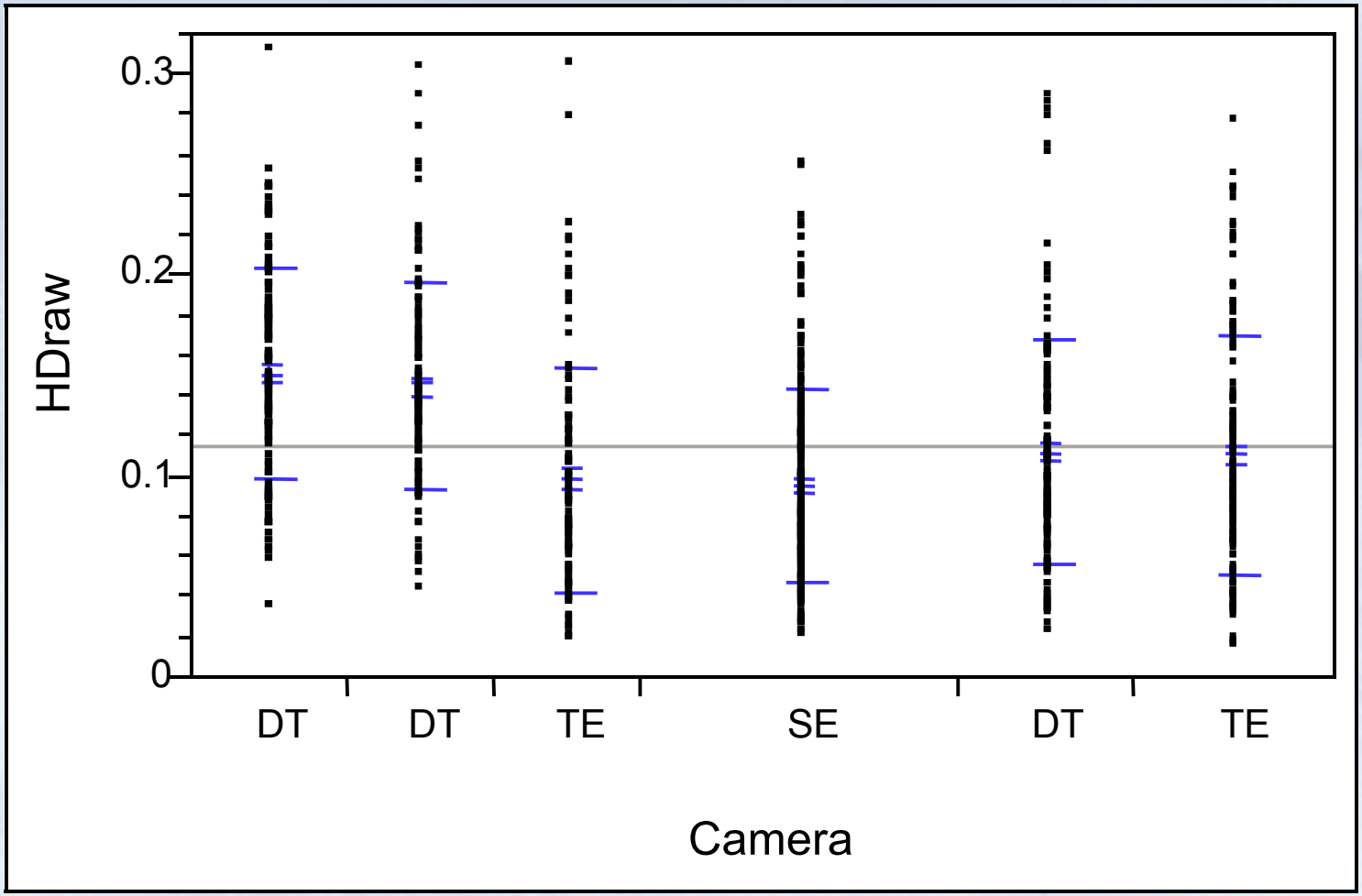
HDraw by Camera



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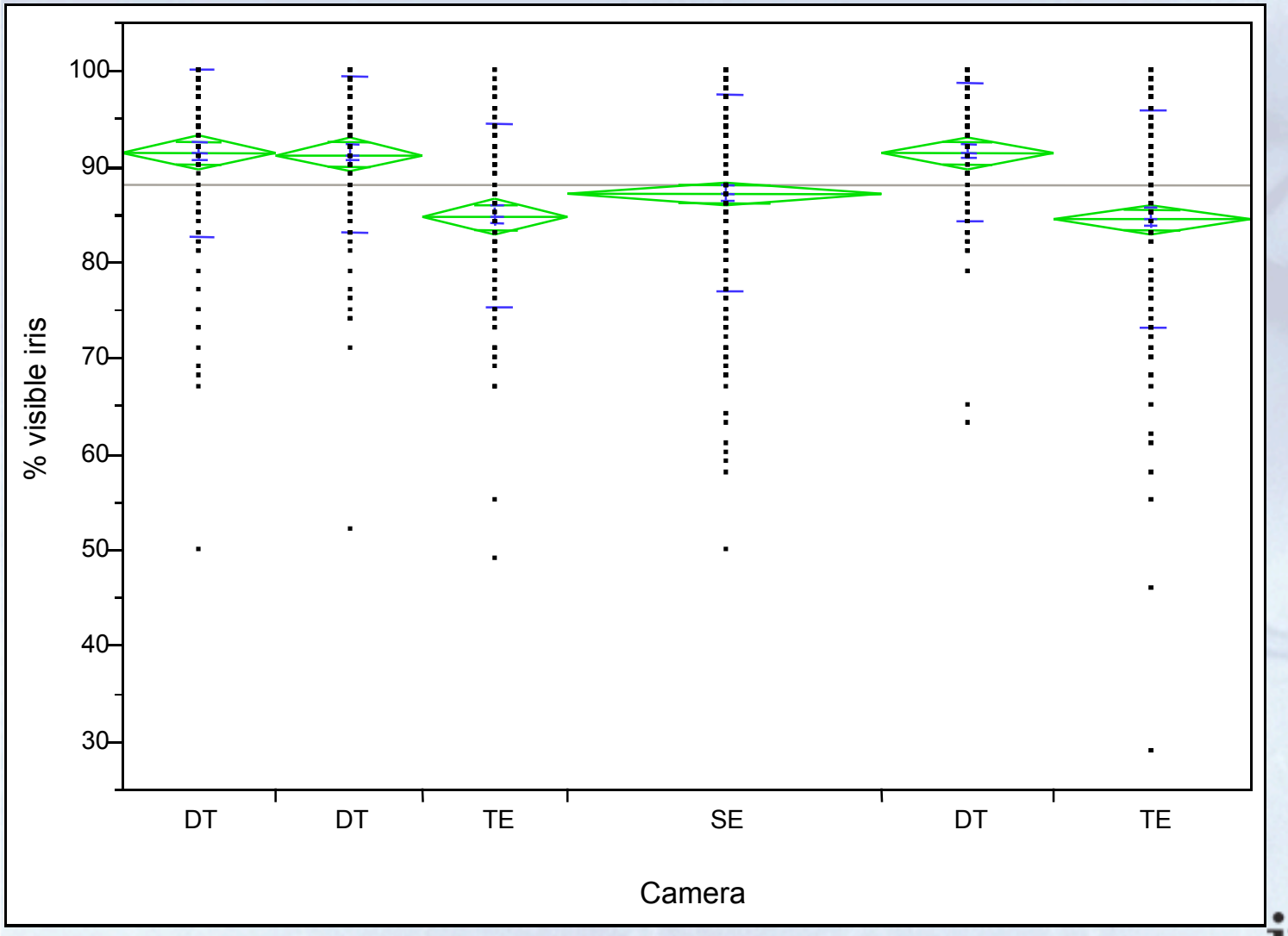
User Motivation Matters



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Conclusions

- Resolution is important, but not comprehensive
- The most significant quality factors (texture energy, % visible iris) are at least partially subject-specific and behavioral
- Current quality recommendations in ANSI/INCITS 379 and ISO/IEC 19794-6 based on pixel resolution are incomplete and should be revised
- Product selection must be based on

  -Quality -Scalability

  -Response Time -Security

  -Interoperability -Cost
- Should "suitable for purpose" judgments be based on quality scores that are unavoidably subject-dependent?

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THANK YOU!

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