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Identity Information Revealed from Mobile Touch Gestures

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PROBLEM STATEMENT

- People store sensitive information on mobile devices

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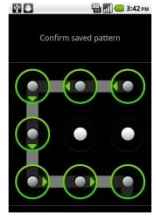
- Develop intelligent user authentication schemes on mobile devices



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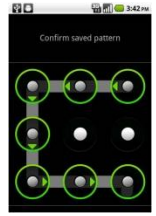
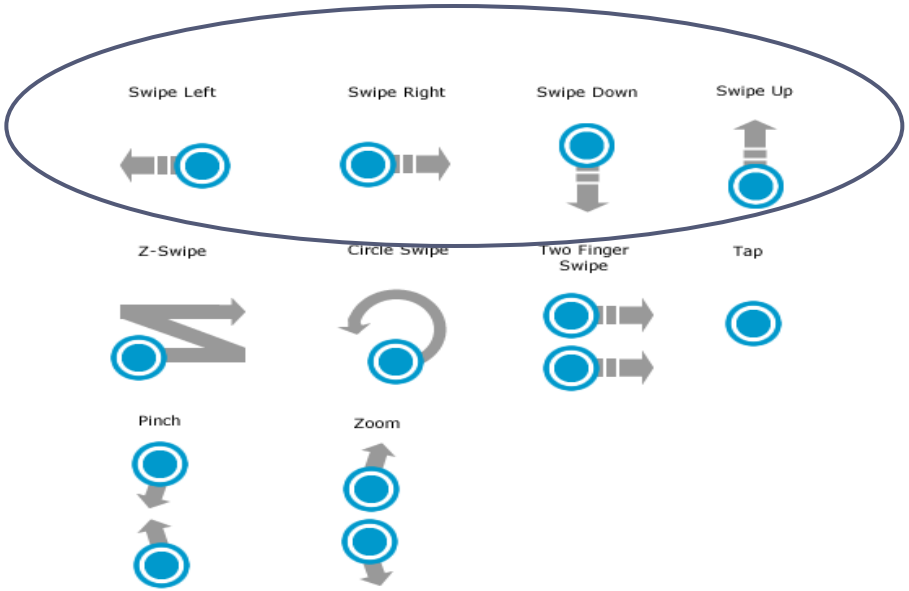
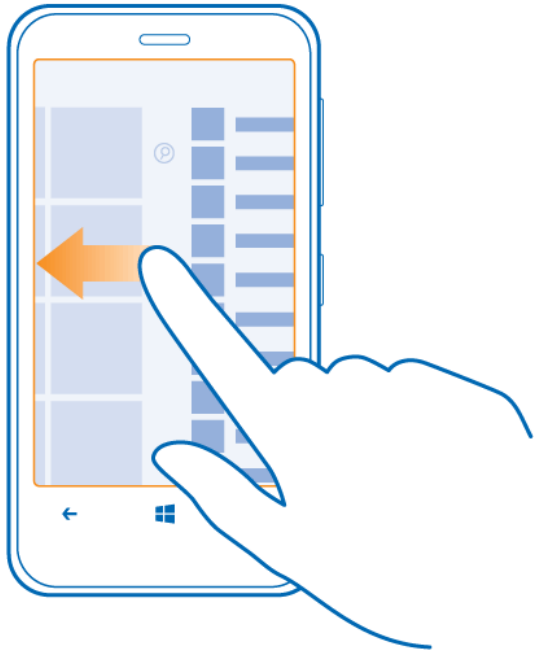


- Develop intelligent user authentication schemes on mobile devices

- Users have unique patterns when interacting with touch screen

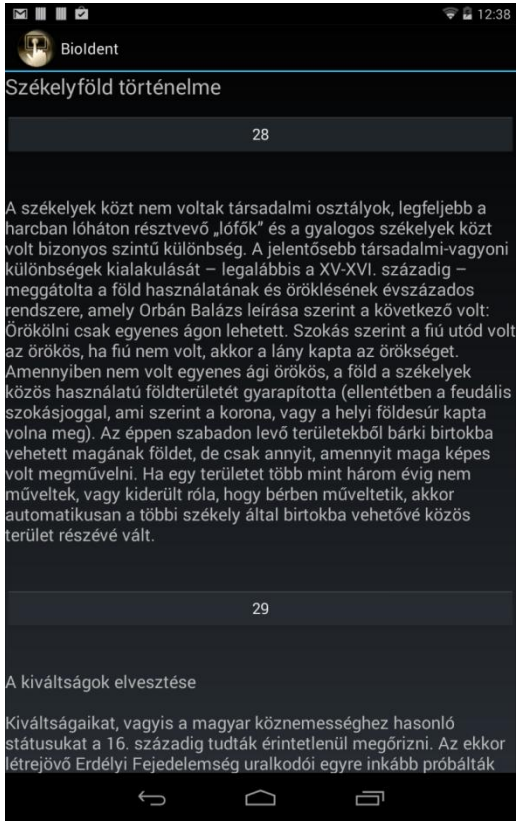
RESEARCH QUESTION

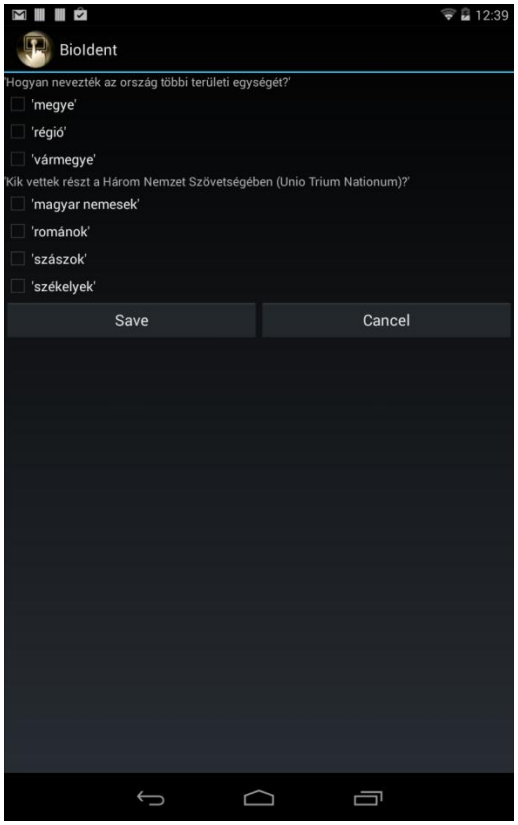


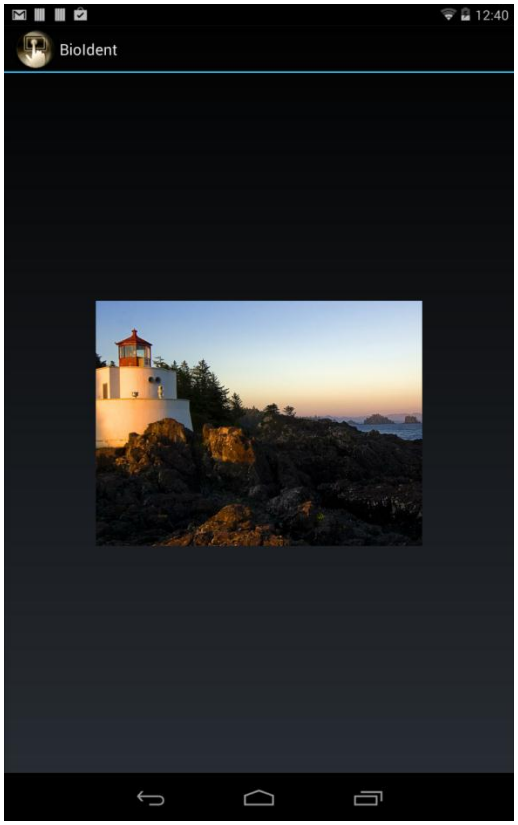


- Touch screen interaction patterns could be used for user identification/authentication?

METHODS – Data collection



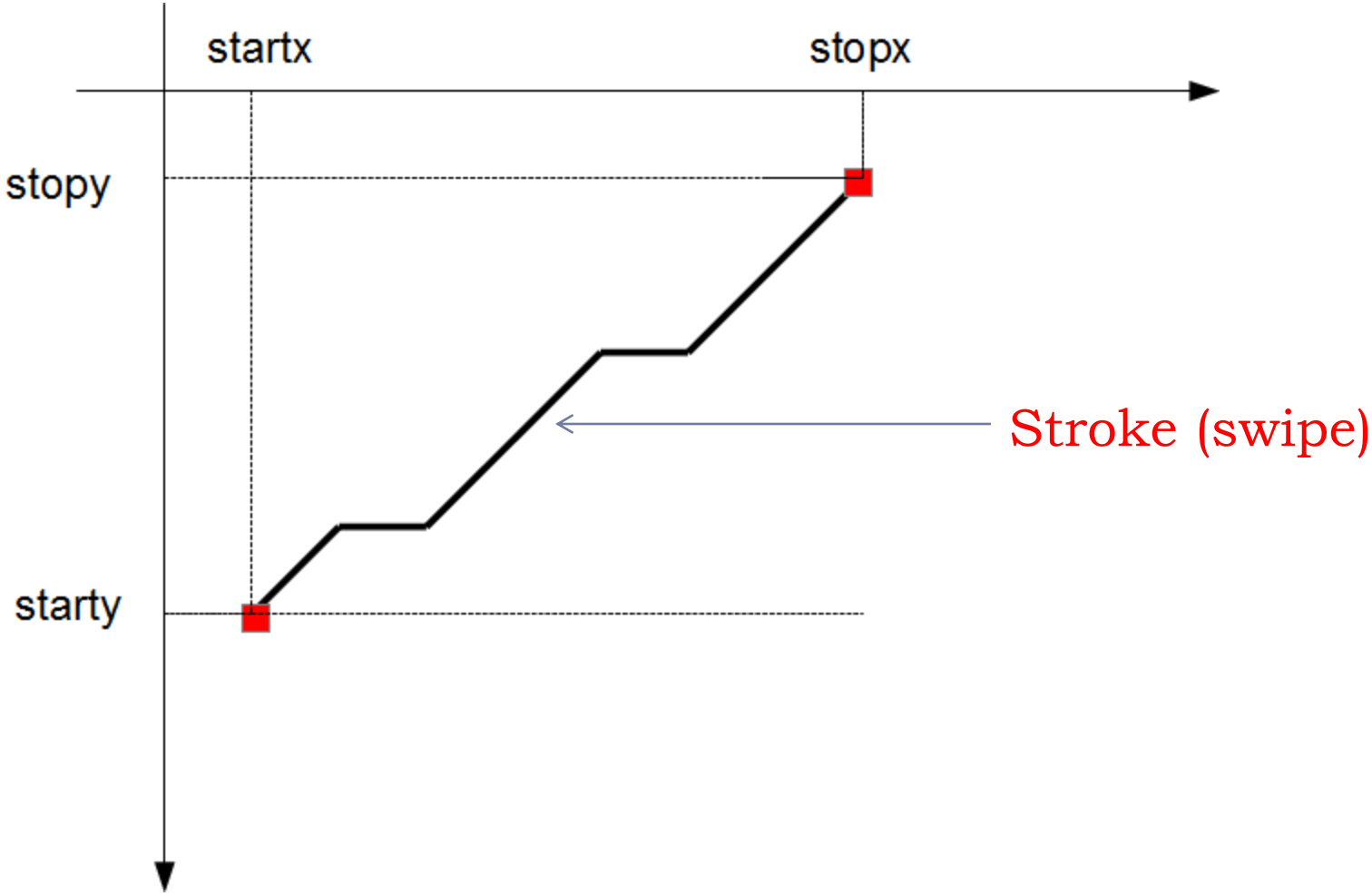




METHODS – Data collection

- 8 different Android devices
  - 320x480 → 1080x1205 resolutions
- 71 users (average age: 29)
  - 56 male
  - 15 female
- Multiple sessions
  - At least 2 sessions/user

METHODS – Feature Extraction



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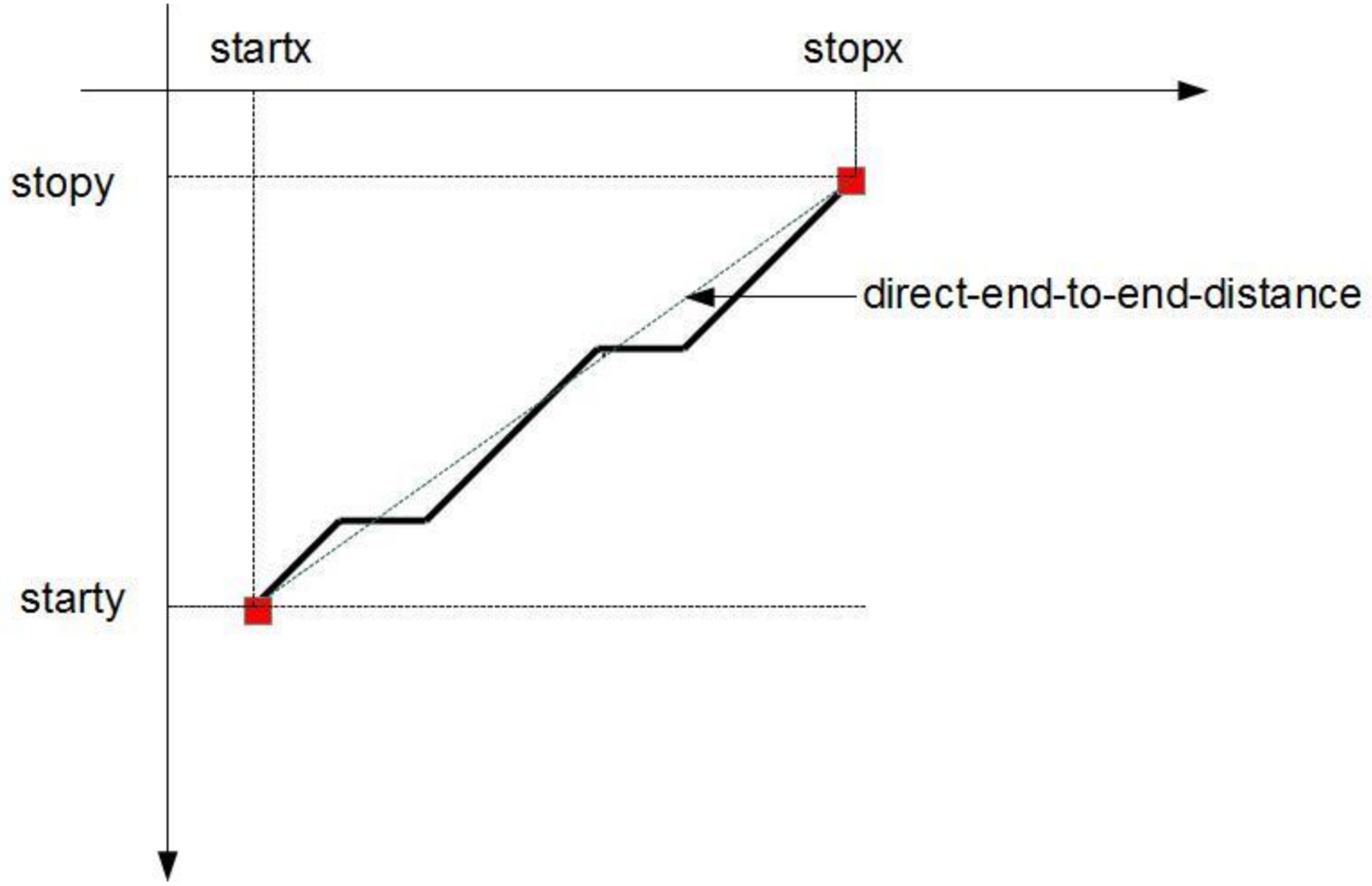

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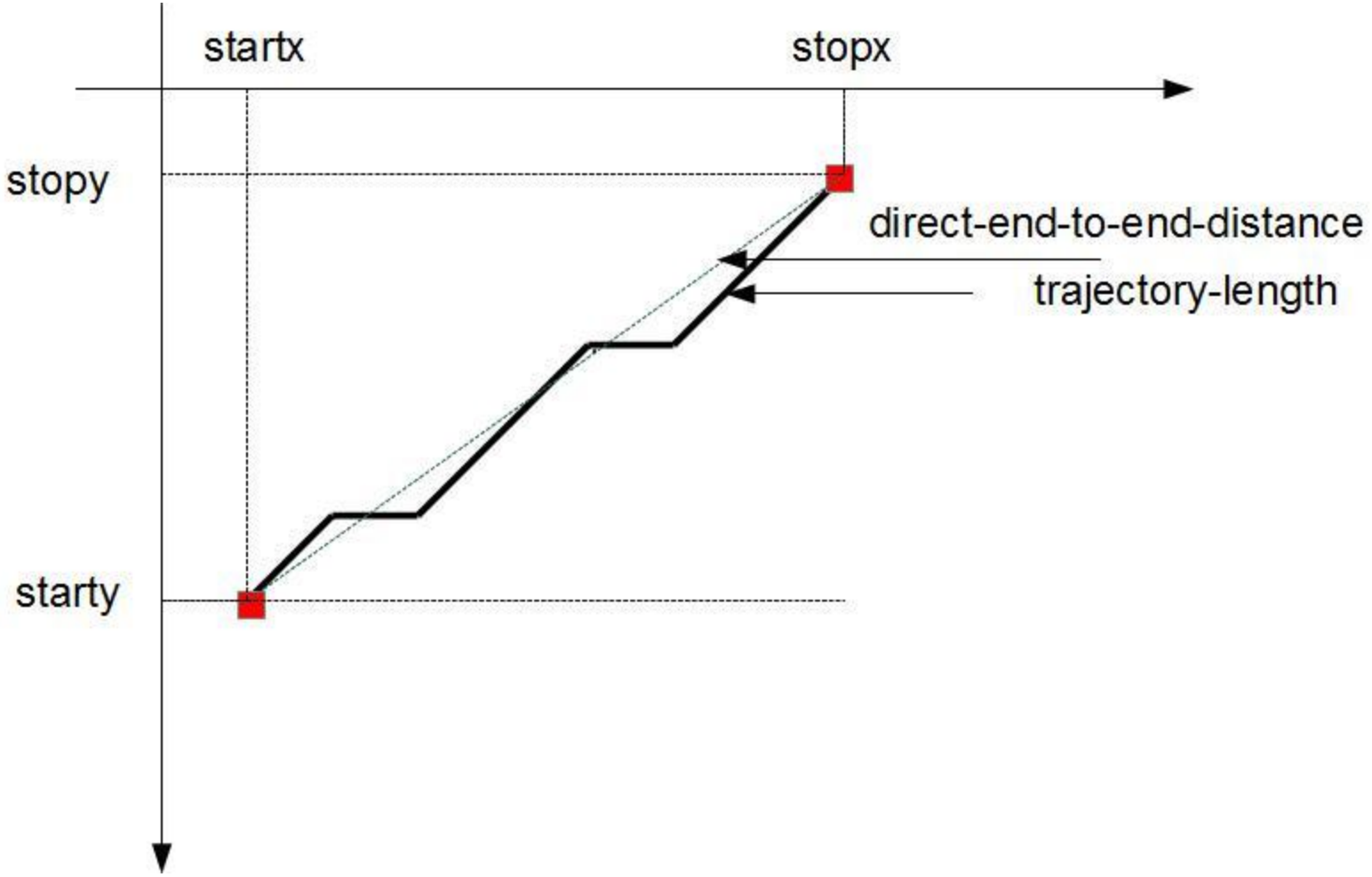

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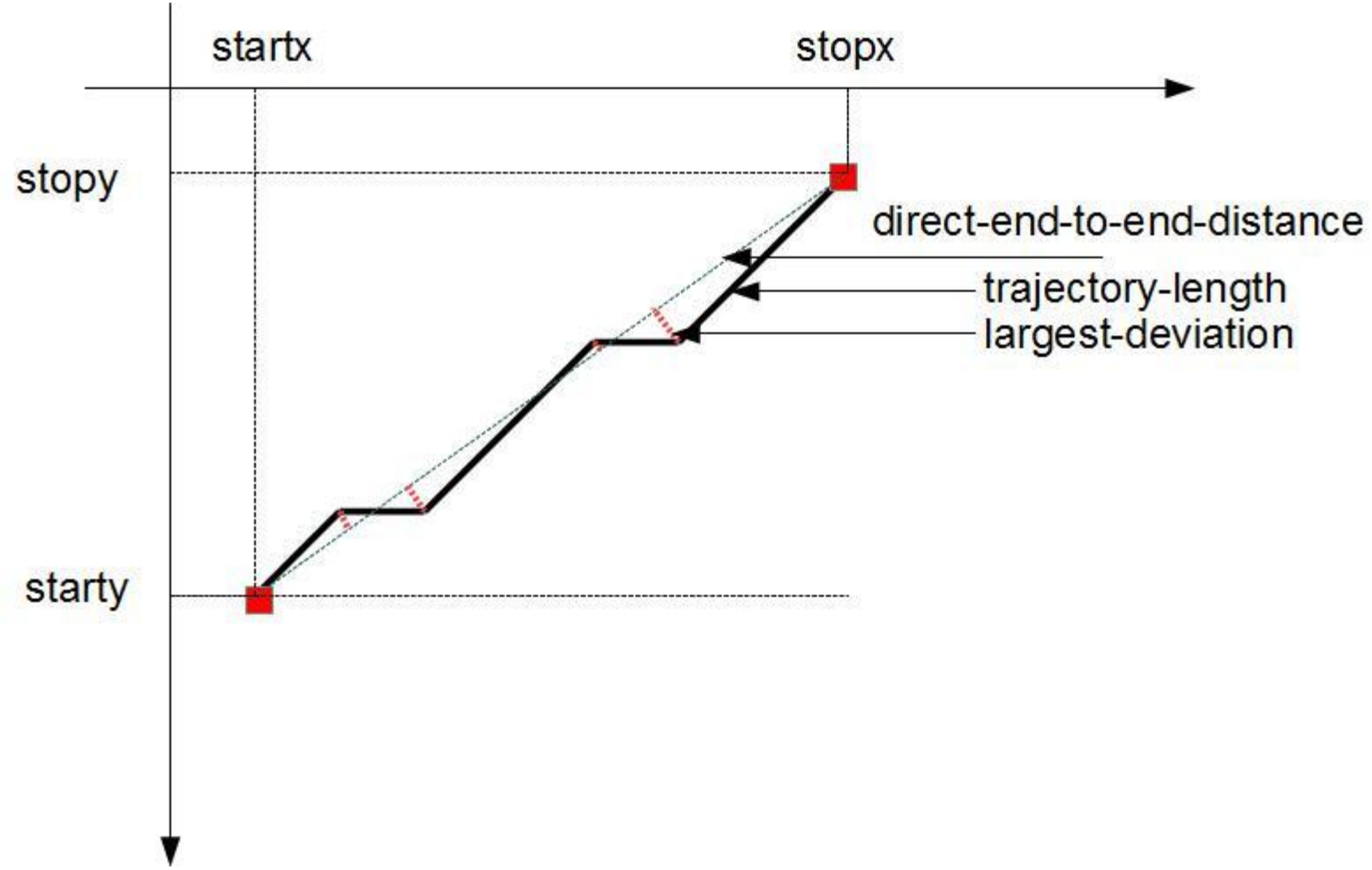

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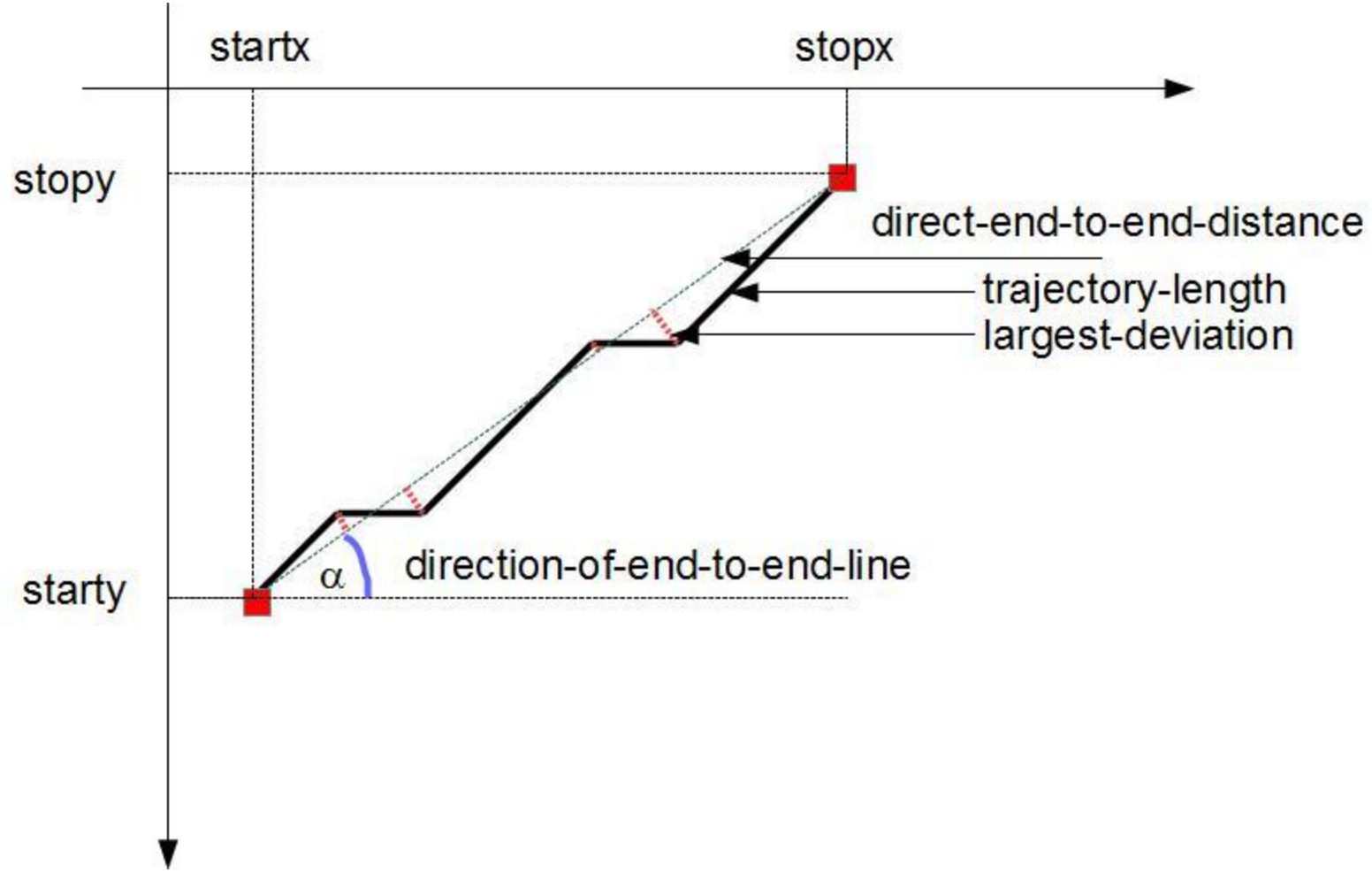
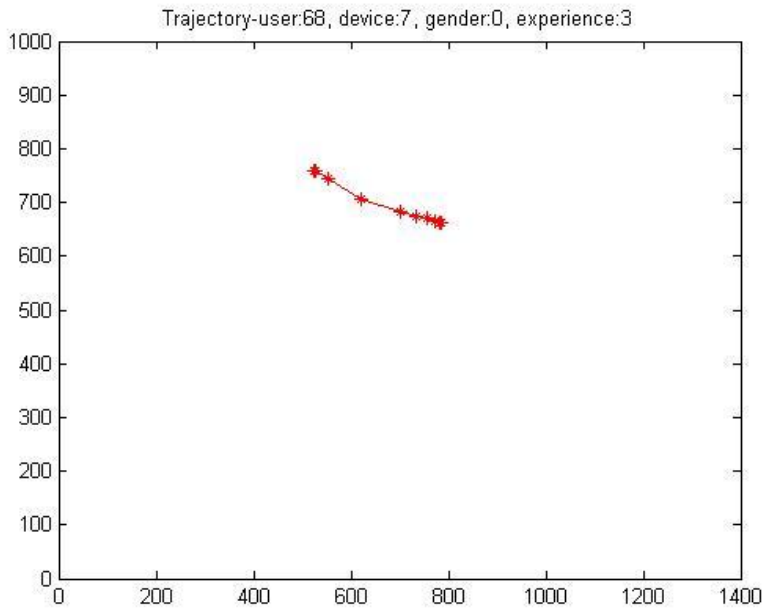
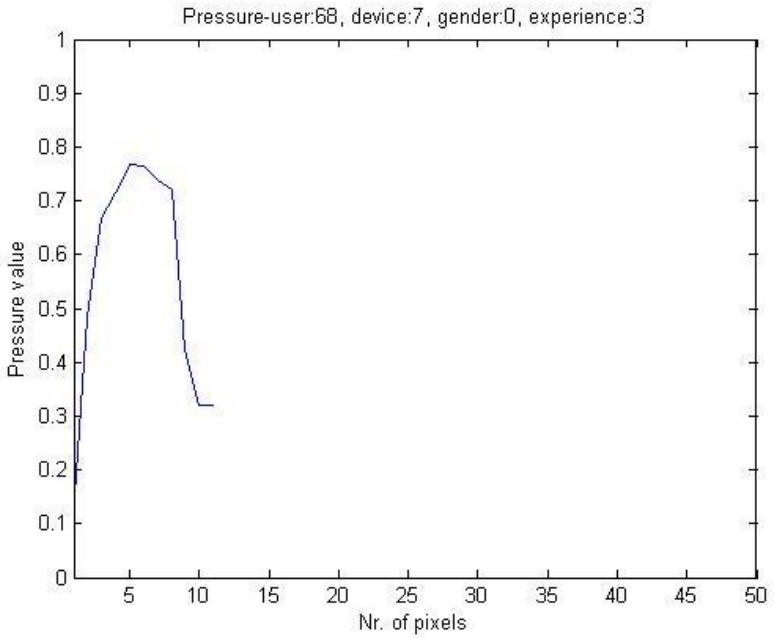


METHODS – Feature Extraction

Mid-stroke pressure



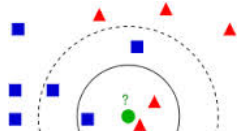


Total: 15 features

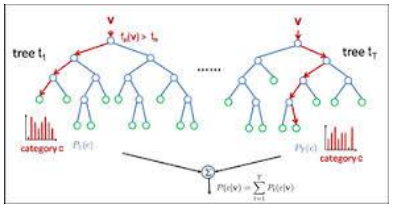
EVALUATION

- Java Program + WEKA Machine Learning

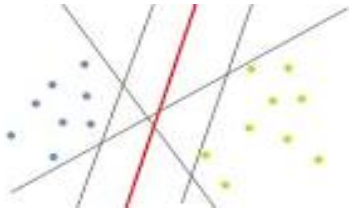
- Classification algorithms
  - K-NN (IBK)



  - Random Forests

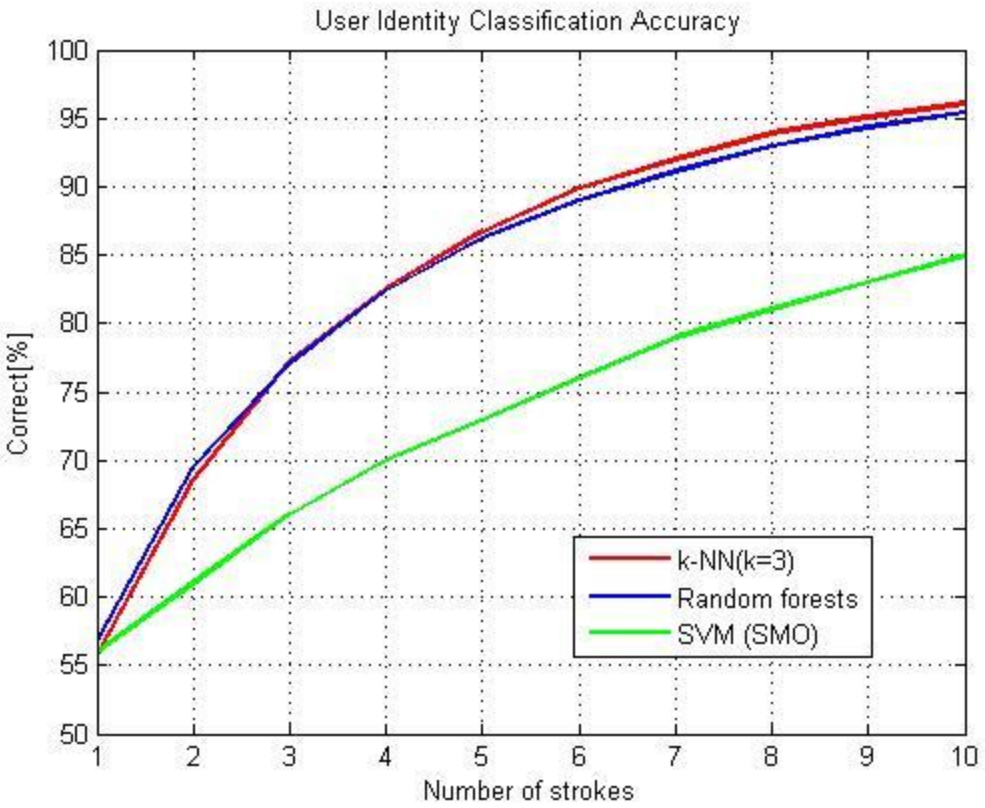


  - SVM (SMO, libSVM)



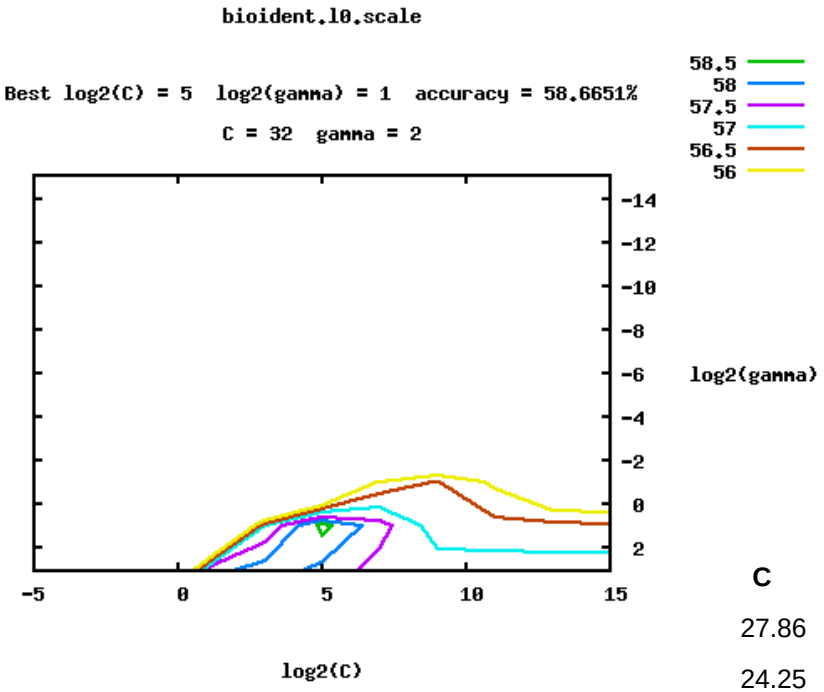
- Dataset size: 14316 instances

EVALUATION: User Identification



- 3-folds cross validation
- SVM (SMO):
  - no parameter tuning
  - Default kernel (Polykernel)
  - C: 1

EVALUATION: User Identification - libSVM

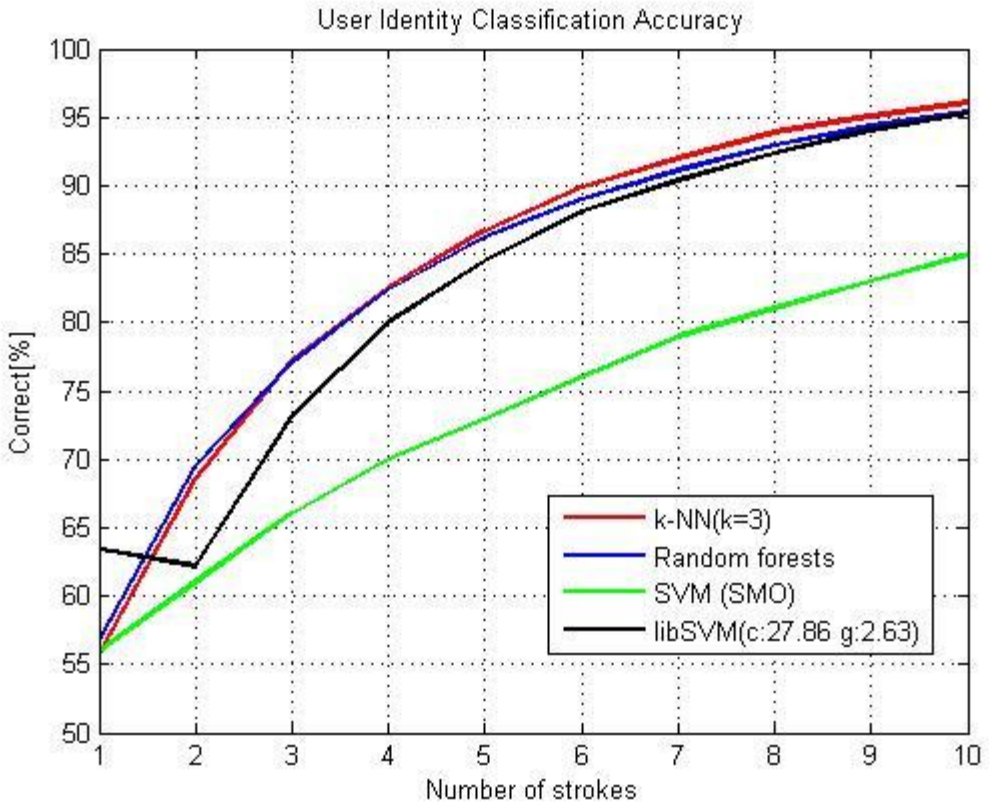


- Parameter tuning
- One-stroke classification

Accuracy

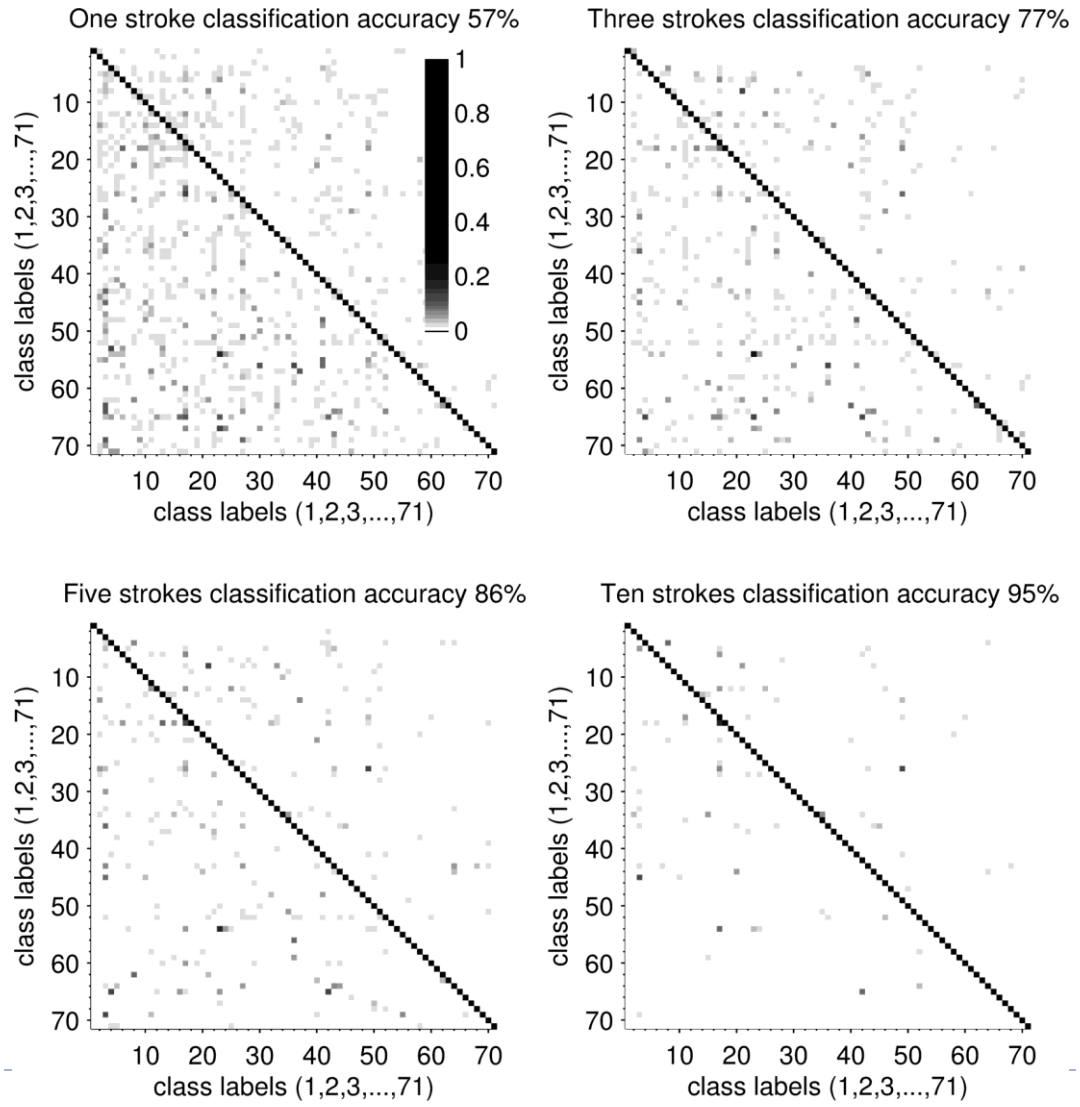
C	g	3 fold s-cross %	10 fold s-cross %
27.86	2.63	60.00	**69.87**
24.25	2.64	60.87	64.03
5.66	6.50	61.21	64.23
32.00	2.00	60.90	63.73
8.00	8.00	61.21	64.36

EVALUATION: User Identification



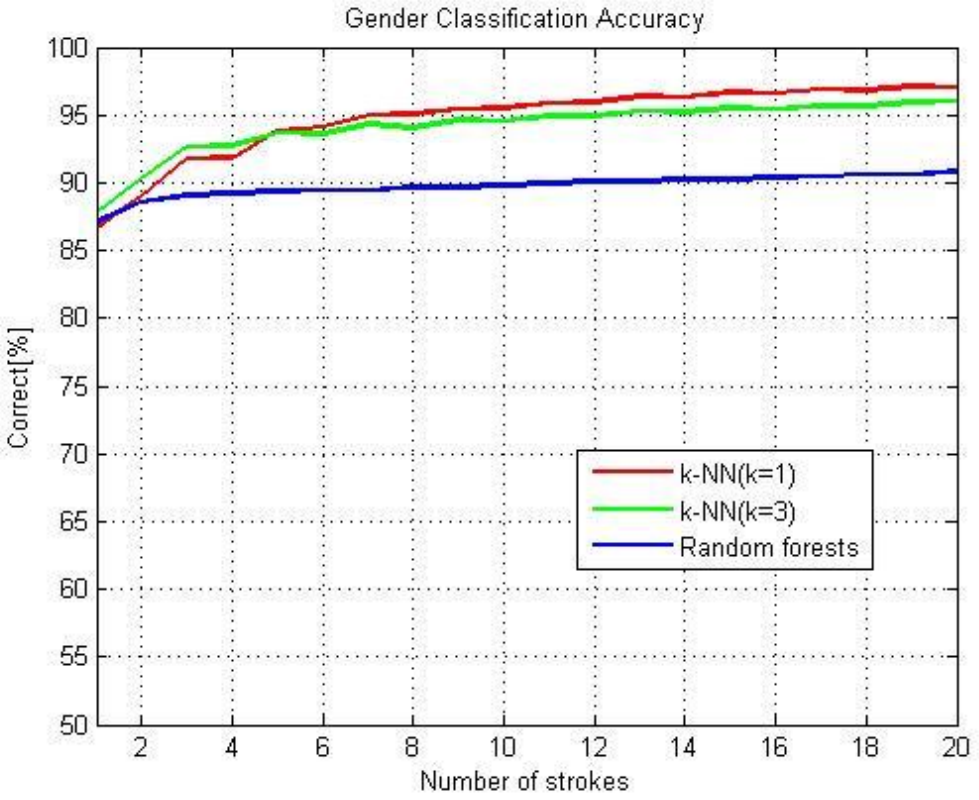
- 3-folds cross validation
- libSVM:
  - RBF kernel
  - C: 27.86
  - Gamma: 2.63

EVALUATION: Confusion Matrix



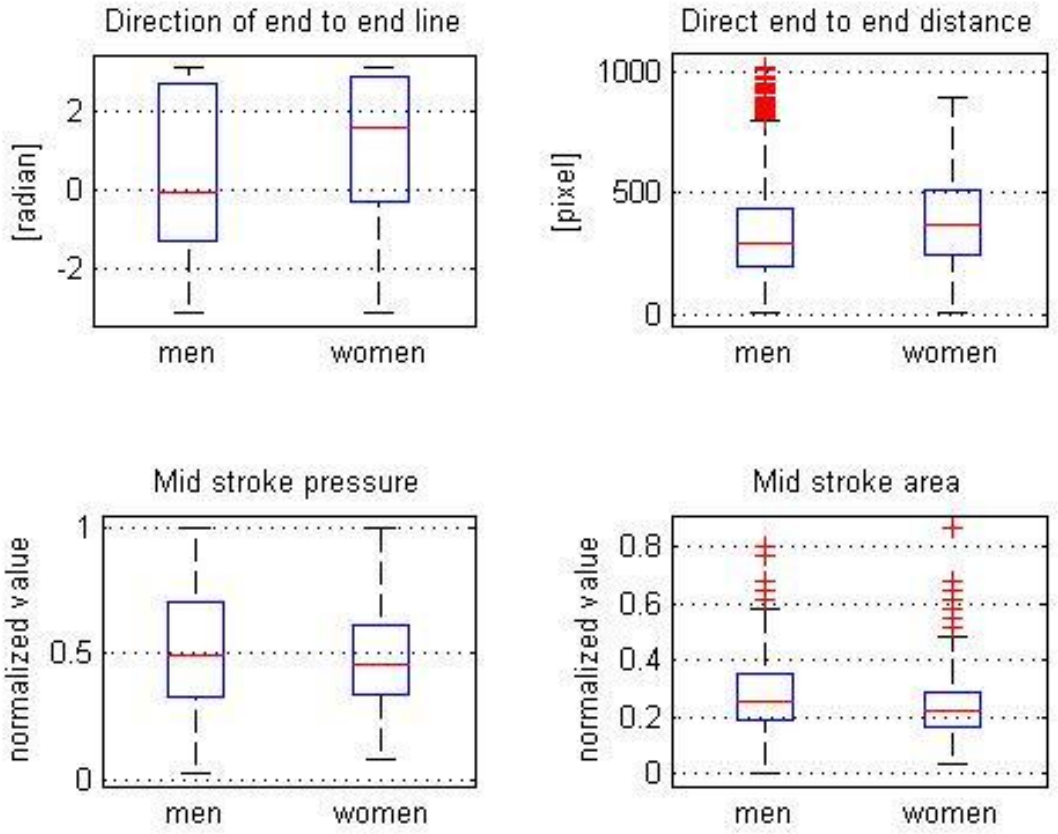
EVALUATION: Gender Classification

- Statistics: 15 men and 15 women



EVALUATION: Gender Differences

- Statistics: 15 men and 15 women



CONCLUSIONS

- Touch Data contain
  - User identity information
    - But: several strokes are required
    - 1.. 10 strokes: 69% . . 95% classification accuracy
  - Gender information
    - 1 stroke: 87% accuracy

- Future direction:
  - Implementation of a Continuous User Authentication System for Android devices

Thank you for your attention!

Questions?