

Modern methods of fall risk prediction

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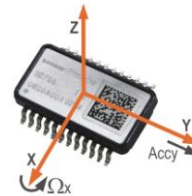
How can we prevent falls?

iStoppFalls

- ICT-based **S**ystem **t**o **P**redict and **P**revent **f**alls at home
- Risk Assessments & Exercises are done by older adults independently in their own homes
- EU-project (FP7)
- 3-years duration (until 2014)
- Consortium
- The project has received funding from the European Community (grant agreement 287361) and the Australian Government.



How does it work?



Fall Risk
Assessment

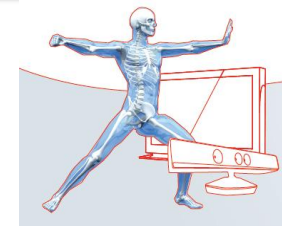
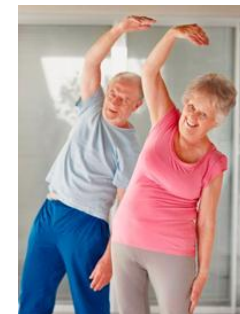
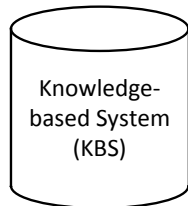
Knowledge-
based System
(KBS)

Adaption of
training plans

Individual
training

Collecting data
(daily activity,
training)

Information &
Feedback



How can we predict falls?

Common approaches in fall risk prediction

- Assessments are conducted in a clinical environment
- Supervised by a physician
- „One-time“ snapshots → long intervals (annually)
- Time consuming for the patient and the physician
- Cost intensive

Modern methods of fall risk prediction

- Risk assessments are done by older adults independently without supervision
- We will use sensor technologies to measure the risk factors:
 - Microsoft Kinect
 - Wearable accelerometer in a necklace (PHILIPS)
- Development:
 1. Fall risk self-assessment
 2. Risk assessment tool



Fall Risk Assessment



**General
descriptive
factors**

- Age, Gender, Height



Questionnaire

- Previous Falls, Medication
- Vision, Peripheral Sensation
- (Fear of falling)



**Physical
assessment**

- Reaction time test
(slower than 250 ms)
- Near-tandem stand
(unable to stand for 10 sec)
- Sit to stand test
(completion in 12 sec)

**Fall
prediction**

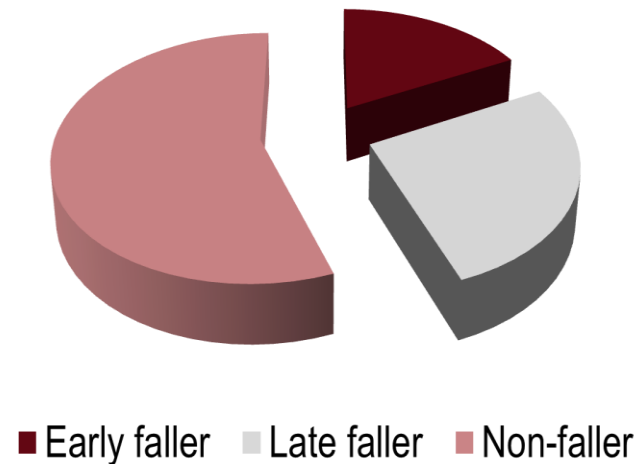
Risk assessment tool

- Aim: Identify **high-risk fallers**
- Data from 372 community-living participants (aged 70 to 90)
 - Monthly fall calendars
 - 1-year follow-up period
- Preliminary prediction model
 - Cost-sensitive meta classifier
 - Naive Bayes

Who are the high-risk fallers?

Preliminary findings

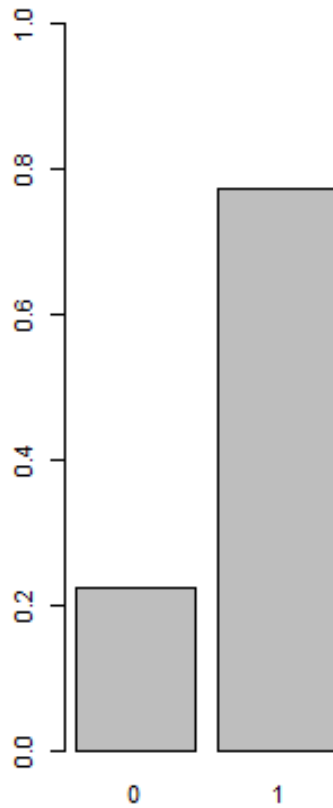
- Early fallers: reported a fall in the first 3 months
- Late fallers: reported a fall after 3 months in the study
- Non-fallers: reported no falls (12 months)



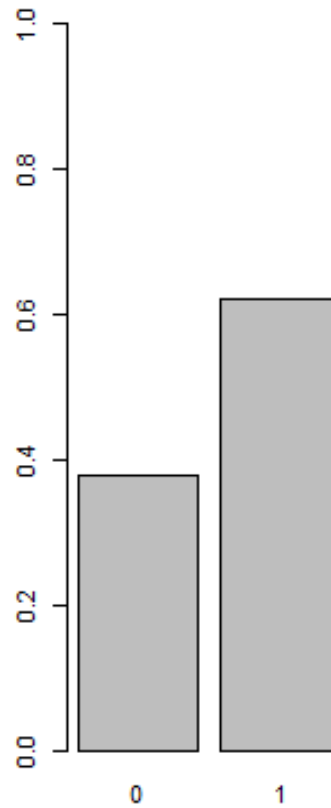
Preliminary findings - Questions

“Do you take 4 or more medications per day?”

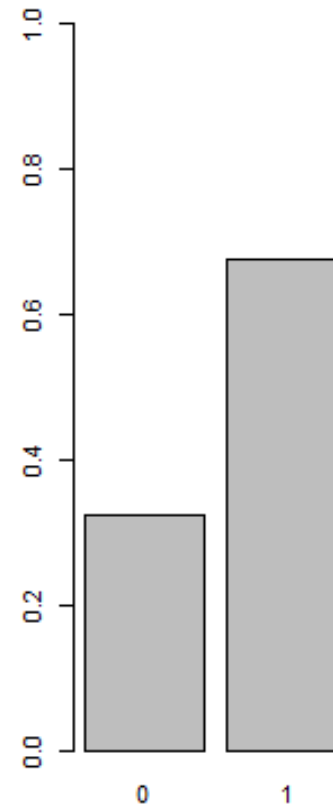
Early faller



Late faller



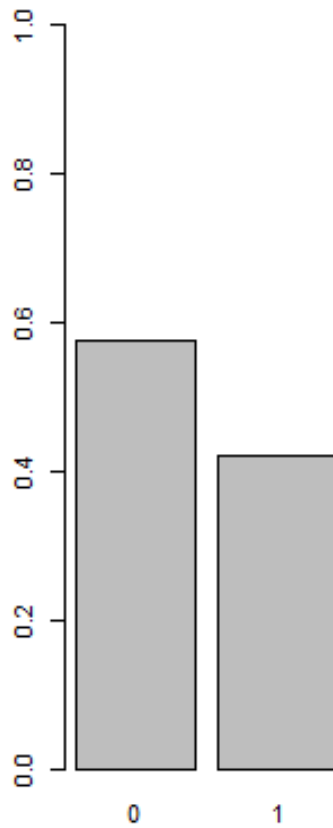
Non-faller



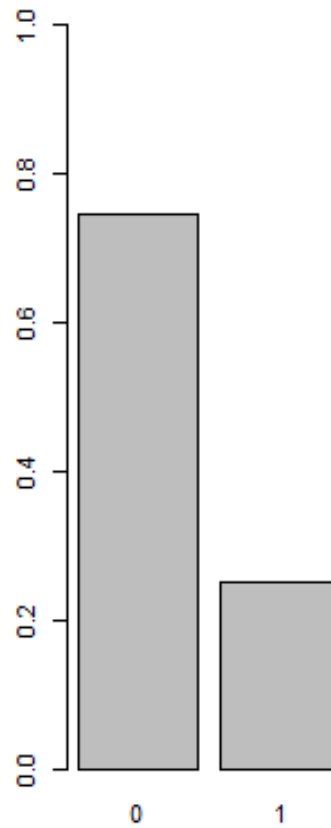
Preliminary findings - Exercises

Mean reaction time slower than 250 ms?

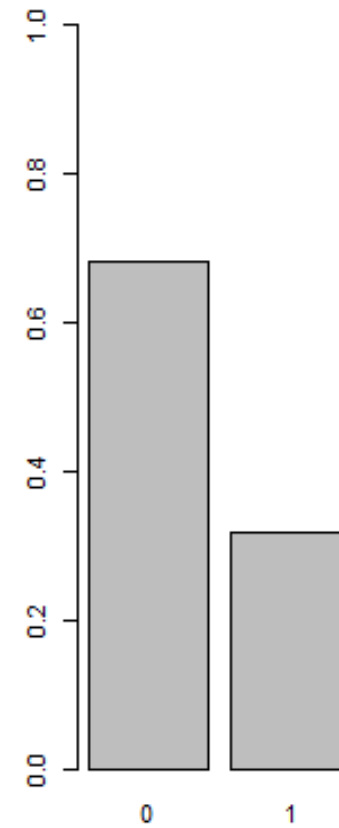
Early faller



Late faller



Non-faller



Preliminary results – Risk assessment tool

- Cost-sensitive classifier + Naive Bayes algorithm
- 10-fold cross-validated

		Actual outcome		Total predicted
		Early faller	Non-faller	
Assessment tool prediction	Early faller	47	44	91
	Non-faller	18	163	181
	Total actual	65	207	

Sensitivity Specificity
 = 72% = 79%

ROC AUC = 0.773

Conclusion and Outlook

- Developed a fall risk assessment & prediction tool
- High-risk (early) fallers were more likely to
 - have previous falls
 - take more than 4 medications
 - have painful feet
 - scored worse on the 3 performance measures
- Trend analysis of the fall risk over time
- Further validation of the risk assessment tool

Thank you!

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