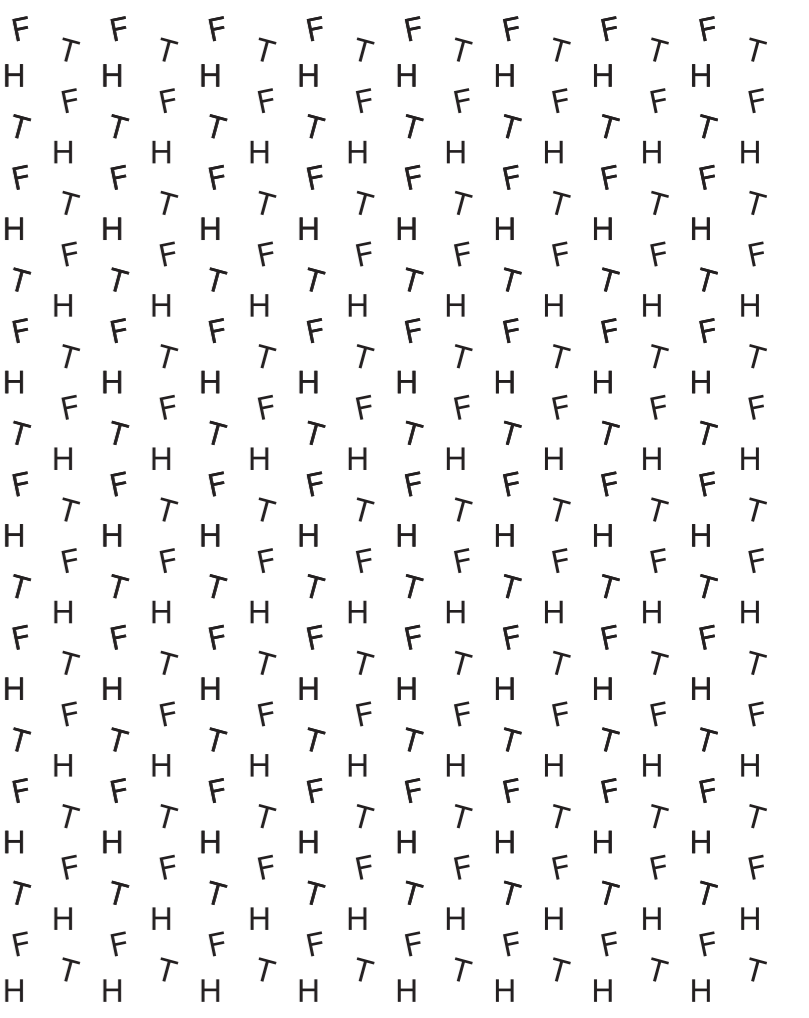


MODULE 1-P2: Fall Risk Assessment

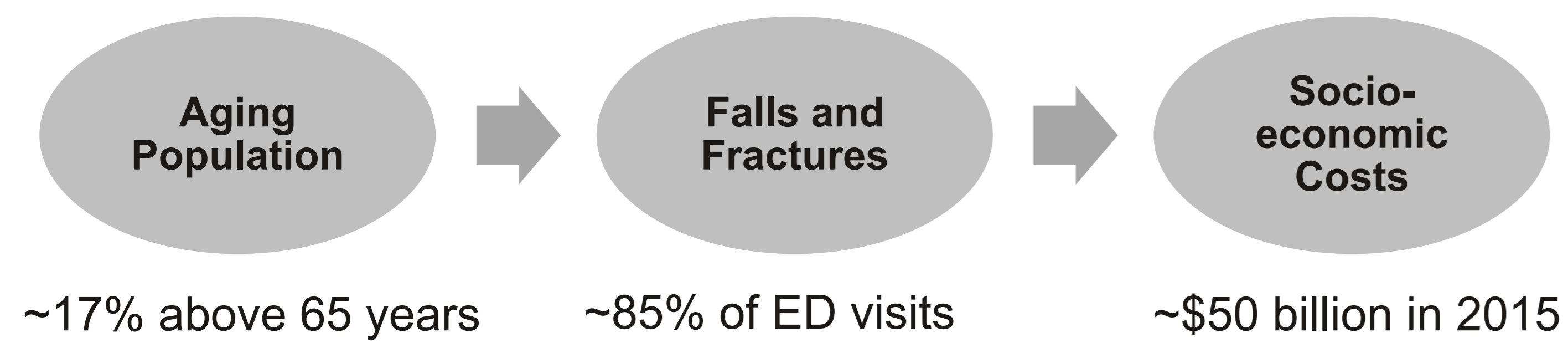
Parastoo Fahimi¹, Kai Zhe Tan¹, Sai G.S. Pai¹, William R. Taylor^{1,2}, Navrag Singh^{1,2}

¹Singapore-ETH Centre, Future Health Technologies Programme, CREATE campus, Singapore

²Institute for Biomechanics, Dept. of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland



1. Why Is It Important



Fall risk assessment is key to identifying individuals at high risk, planning ahead, and tailoring prevention and intervention programs.

Ministry of Manpower, *Population in brief*, 2021.

Yeo et al., *A review of elderly injuries seen in a Singapore emergency department*. Singapore Med J, 2009.

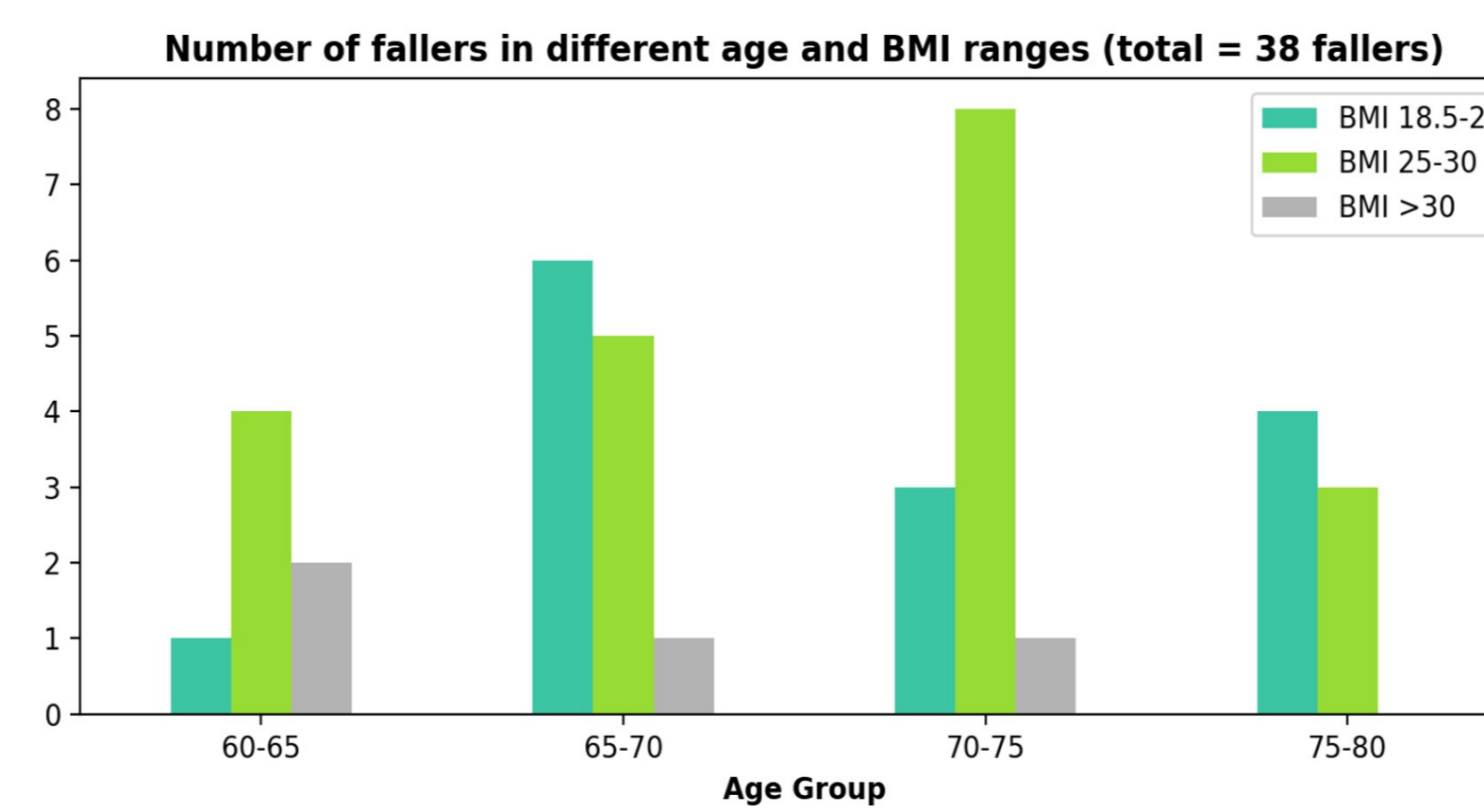
Florence et al., *Medical Costs of Fatal and Nonfatal Falls in Older Adults*. J Am Geriatr Soc, 2018.

2. Preliminary Work

Analysis Cohort

- 80 participants with an average age of 69±4
- 42 non-faller, 38 faller

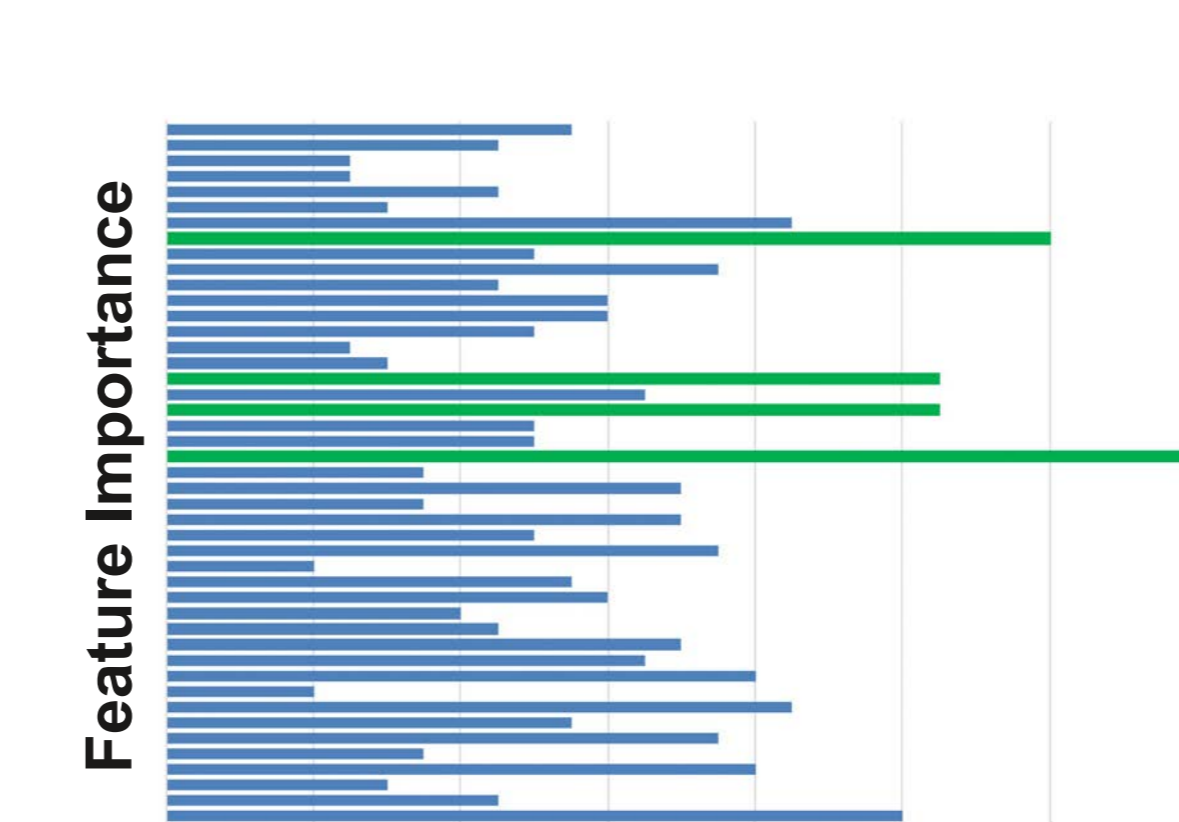
	Fallers	Non-fallers	P-value
Age	69±4	68±4	0.86
BMI	26±3	25±3	0.45



Fahimi et al., *Identifying Fallers Based on Functional Parameters: A Machine Learning Approach*, IEEE CSDE, 2021.

Results

	AUROC	Accuracy	Sensitivity	Specificity	PPV	NPV
SVM	72.8 (8.4)	72.5 (2.5)	72.2 (10.2)	72.7 (8.3)	70.5 (5.1)	75.5 (4.9)
KNN	79.2 (5.9)	74.5 (5.6)	74.0 (8.6)	75.2 (10.4)	73.9 (8.1)	76.3 (7.1)
RF	74.4 (5.4)	73.5 (3.9)	70.5 (9.2)	76.5 (9.1)	73.4 (6.3)	74.9 (6.6)
MLP	68.7 (5.6)	64.5 (4.7)	66.1 (12.9)	62.8 (11.4)	62.2 (6.3)	68.1 (5.7)
LR	67.4 (5.4)	67.0 (4.5)	65.7 (19.1)	68.5 (18.7)	69.3 (12.4)	70.7 (7.7)



Top Features (green bars)

- Step width (mean)
- Center of Pressure (RMS and mean)
- Maximum foot clearance (SD and CV)
- Maximum foot clearance (mean)

P-values	SVM	KNN	RF	MLP	LR
SVM	-	0.50	0.53	0.05	0.02
KNN	-	-	0.52	0.02	0.02
RF	-	-	-	0.04	0.02
MLP	-	-	-	-	0.50
LR	-	-	-	-	-

3. Our Approach

Data

PIONEER¹ Cohort

TARGET² Cohort

It has recruited 1500 Singaporean citizens (>60 years)

It will recruit 3000 Singaporean citizens (>60 years)

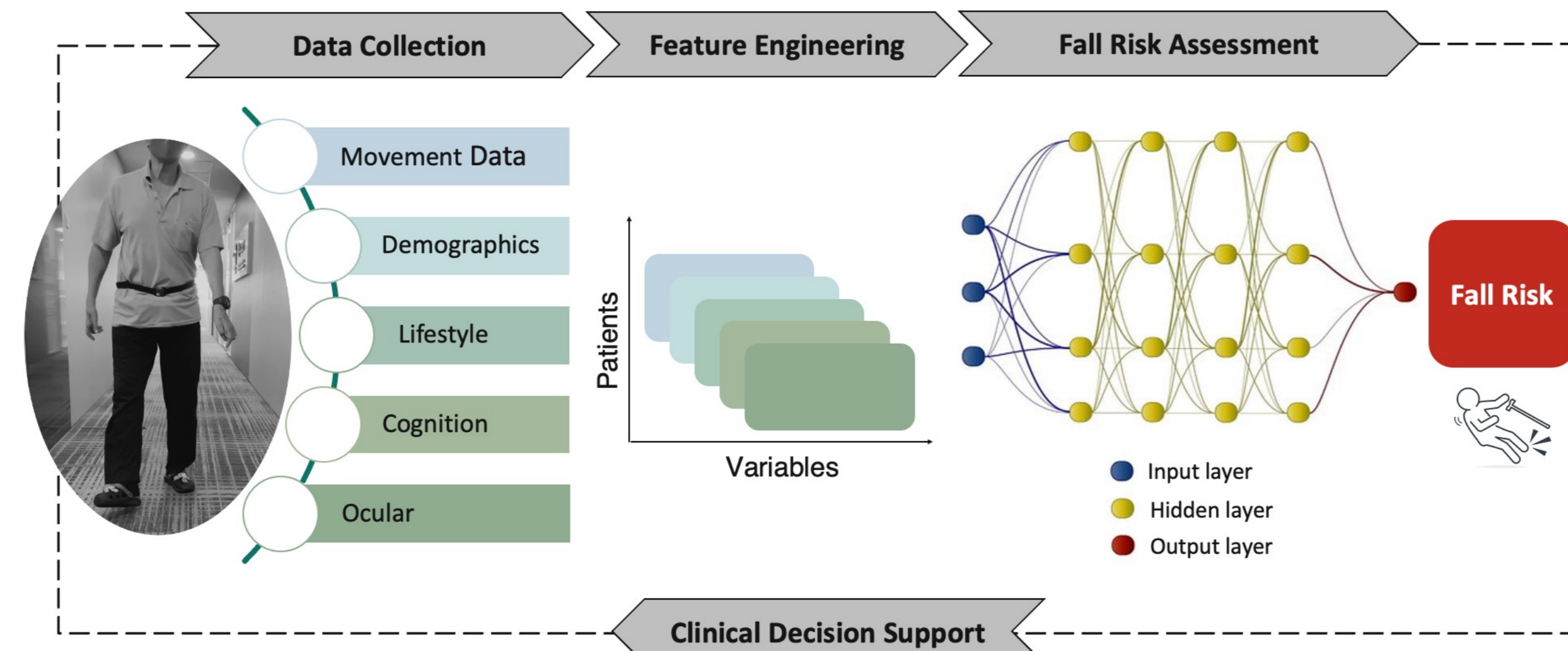
- **Gait assessment**
- Socio-demographic
- Physical health status
- Cognition
- Life Space
- Ocular health
- Nutrition status
- **Status and fear of falling**

- **Gait assessment**
- Socio-demographic
- Physical health status
- Cognition
- Life Space & Home Safety
- Social network
- Resilience and Depression
- **Status and fear of falling**

1. The PopulatIOn Health and Age-Related SEnsory Decline Profile.
2. Targeted Assessment and Recruitment of Geriatrics for Effective Fall Prevention Treatments

Risk Prediction

- Neural networks and classical machine learning methods (SVM, KNN, LR, etc.)
- Retrospective and prospective evaluation
- Feature importance analysis



Risk Communication

- Step 1: Focus group discussions with a panel of clinicians**
 - Engaging stakeholders
 - Learning about available tools and their gaps
 - Learning about clinicians' expectations of an FRA tool
- Step 2: Survey design, implementation, and analysis**
 - Based on the input from step 1, a survey will be designed
 - The survey will be administered to a panel of clinicians
 - Results will reveal the essential features of the risk assessment tool
- Step 3: GUI and model development**
 - Based on the survey results, an interactive GUI will be developed
 - Predictive model development in parallel
- Step 4: Usability assessment**
 - Usability assessment
 - Feedback session to discuss pathways to implementation

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