Early Detection of Motor Frailty in Older Adults
FRAKITEST Project

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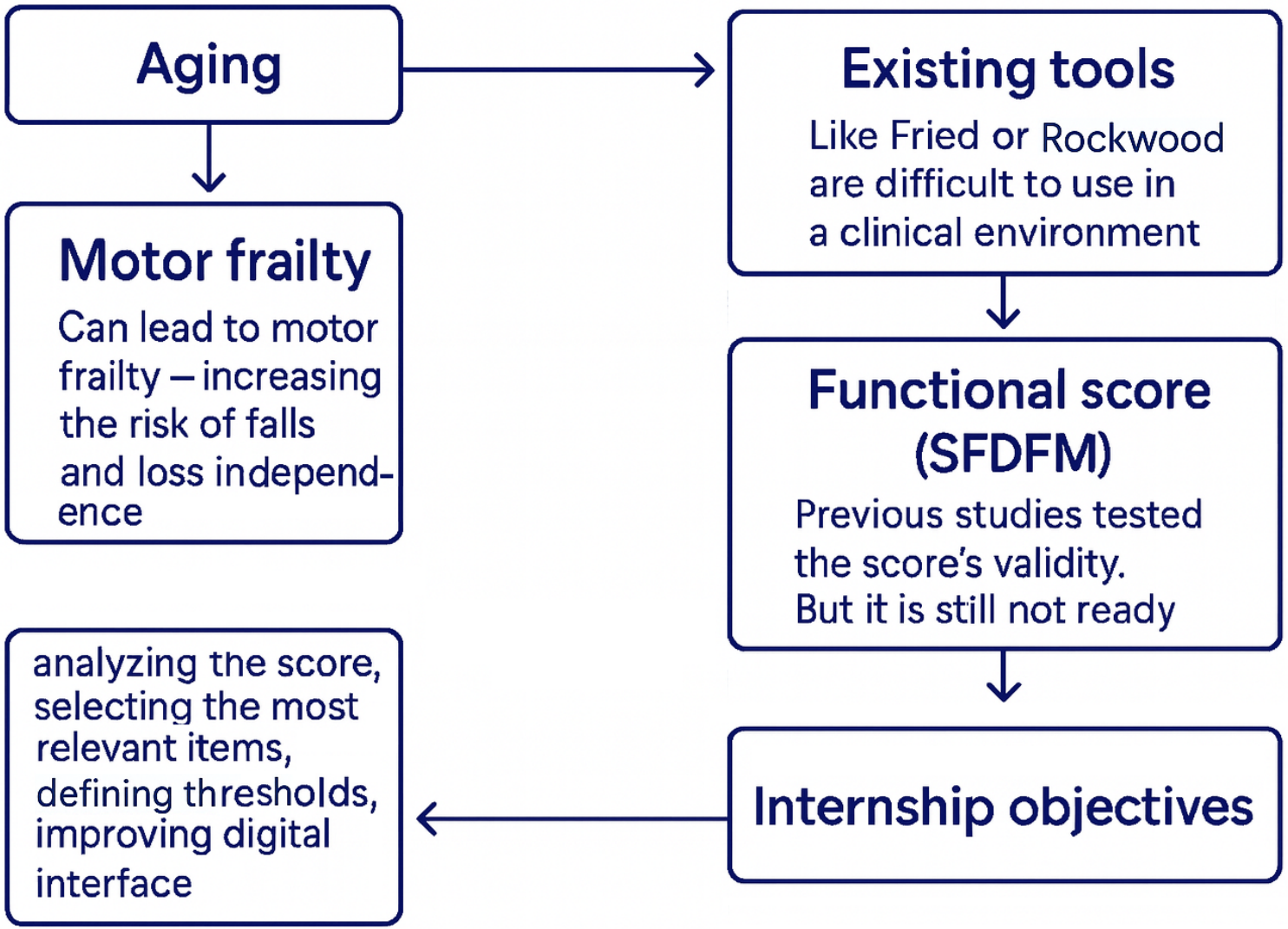
Presentation Roadmap

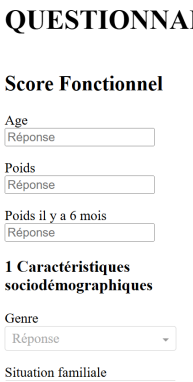
1. **Improvement of the digital SFDFM interface**
2. **Analysis of the most influential variables**
3. **Determination of classification thresholds**
4. **Comparability analysis between patient groups**
5. **Final summary and perspectives**

From Aging to a Screening Challenge



Evolution of the Digital Interface – Questionnaire

First version (2024)


QUESTIONNAIRE DE DÉPISTAGE DE LA FRAGILITÉ MOTRICE

Score Fonctionnel

Age
Réponse

Poids
Réponse

Poids il y a 6 mois
Réponse

1 Caractéristiques sociodémographiques

Genre
Réponse

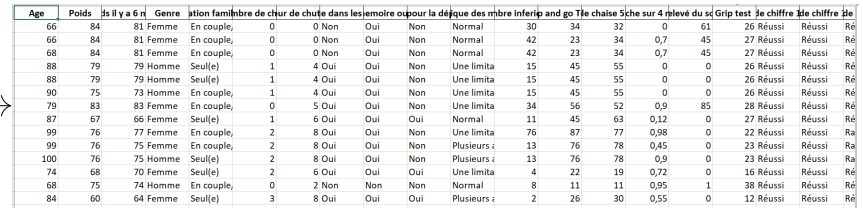
Situation familiale

Improved version

- **First version (Dorian, 2024):** with basic form, one Excel file per submission
- **Improved version (internship):** visually more structured, added patient ID for tracking

Evolution of the Digital Interface – Consultation & Data

Consultation interface



Age	Poids	ds il y a 6 n	Genre	ation famil	mbre de chu	r de chute	dans les	emoire ou	pour la dé	que des m	mbre inferi	p and go	Tle chaise 5	che sur 4	relevé du s	Grip test	le chiffre	de chiffre	de	
66	84	81	Femme	En couple,	0	0	Non	Oui	Non	Normal	30	34	32	0	61	26	Réussi	Réussi	Ré	
66	84	81	Femme	En couple,	0	0	Non	Oui	Non	Normal	42	23	34	0,7	45	27	Réussi	Réussi	Ré	
68	84	81	Femme	En couple,	0	0	Non	Oui	Non	Normal	42	23	34	0,7	45	27	Réussi	Réussi	Ré	
88	79	79	Homme	Seul(e)	1	4	Oui	Oui	Non	Une limita	15	45	55	0	0	26	Réussi	Réussi	Ré	
88	79	79	Homme	Seul(e)	1	4	Oui	Oui	Non	Une limita	15	45	55	0	0	26	Réussi	Réussi	Ré	
90	75	73	Homme	En couple,	1	4	Oui	Oui	Non	Une limita	15	45	55	0	0	26	Réussi	Réussi	Ré	
79	83	83	Femme	En couple,	0	5	Oui	Oui	Non	Une limita	34	56	52	0,9	85	28	Réussi	Réussi	Ré	
87	67	66	Femme	Seul(e)	1	6	Oui	Oui	Oui	Normal	11	45	63	0,12	0	27	Réussi	Réussi	Ré	
99	76	77	Femme	En couple,	2	8	Oui	Oui	Non	Une limita	76	87	77	0,98	0	22	Réussi	Réussi	Ra	
99	76	75	Femme	En couple,	2	8	Oui	Oui	Non	Plusieurs a	13	76	78	0,45	0	23	Réussi	Réussi	Ra	
100	76	75	Homme	Seul(e)	2	8	Oui	Oui	Non	Plusieurs a	13	76	78	0,9	0	23	Réussi	Réussi	Ra	
74	68	70	Femme	Seul(e)	2	6	Oui	Oui	Oui	Une limita	4	22	19	0,72	0	16	Réussi	Réussi	Ré	
68	75	74	Homme	En couple,	0	2	Non	Non	Non	Normal	8	11	11	0,95	1	38	Réussi	Réussi	Ré	
84	60	64	Femme	Seul(e)	3	8	Oui	Oui	Oui	Plusieurs a	2	26	30	0,55	0	12	Réussi	Réussi	Ré	

Centralized Excel file

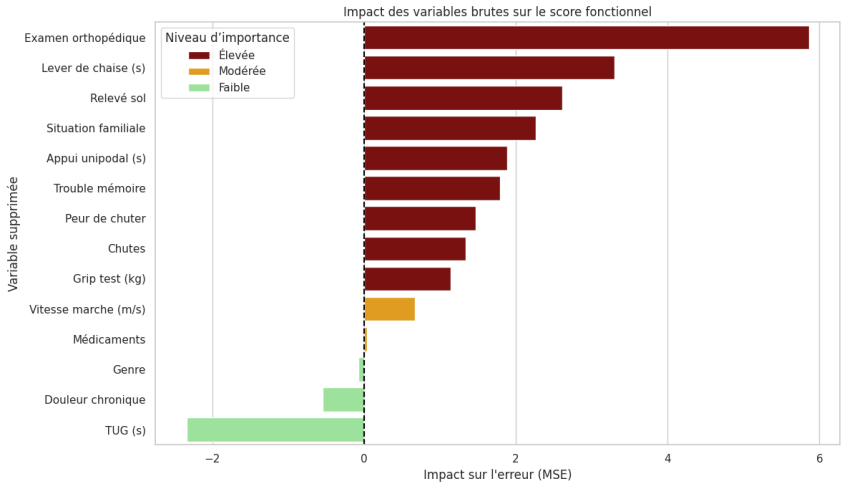
- **Consultation interface:** access for authorized users, retrieves patient data stored on Girder
- **Centralized Excel file:** all data are stored in one single file, Each line corresponds to one patient → easier analysis and follow-up

Dataset Used in This Internship

- Source: validated collection conducted in 2024 by **Aude Le Ménez**
- Participants: **89 patients**, all aged over 65
- Context: mostly assessed in private physiotherapy practices or at home
- Method: using the paper version of the SFDFM
- Note: *No new clinical data were collected during this internship*
- Contribution: the digital interface is now ready for future large-scale acquisition

Most Influential Variables – Global Model

- Method: Linear regression + LOO cross-validation
- $R^2 = 0.82$ (n = 65)
- We obtained this top variables:
  - Orthopedic exam
  - Chair rise
  - Ground rise
  - Family situation
  - Unipedal stance
  - Memory issue



Fried Subgroups – Full vs Reduced Models

Most influential variables per Fried subgroup

Fried Class	Most Influential Variables	R^2	MSE
Non-frail	Orthopedic exam, Unipedal stance, Falls	0.6811	1.92
Pre-frail	Fear of falling, Falls, Memory issue	0.1668	10.71
Frail	Sex, Chronic pain, Ground rise	–19.37	1178.31

TABLE 3 – Most influential variables per Fried subgroup (14-variable models)

Comparison: full (14 vars) vs reduced (6 vars)

Fried Class	Model	Variables	R^2	MSE	Improvement
Non-frail	Full	14	0.6811	1.92	–
	Reduced	6	0.4343	3.41	↓ performance
Pre-frail	Full	14	0.1668	10.71	–
	Reduced	6	0.2711	9.36	↑ performance
Frail	Full	14	–19.37	1178.31	–
	Reduced	6	0.3961	34.93	↑ performance

TABLE 4 – Performance comparison by Fried subgroup – full vs reduced (6-variable) models

SFDFM Threshold Search – Method Comparison

Context: Multiple methods were tested to define optimal thresholds for classifying SFDFM scores into Fried categories.

Method	Thresholds (t1 / t2)	Accuracy	Frail Se / Sp	Notes
Grid Search	8 / 18	66.18%	0.800 / 0.959	Simple, exhaustive
Logistic Regression	7.88 / 21.55	63.97%	0.533 / 0.975	Continuous probabilities
Decision Tree	6.5 / 18.5	65.44%	0.800 / 0.959	Interpretable rules
XGBoost	8 / 18	66.18%	0.800 / 0.959	Robust, consistent with Grid Search

Selected SFDFM Thresholds

Final choice:

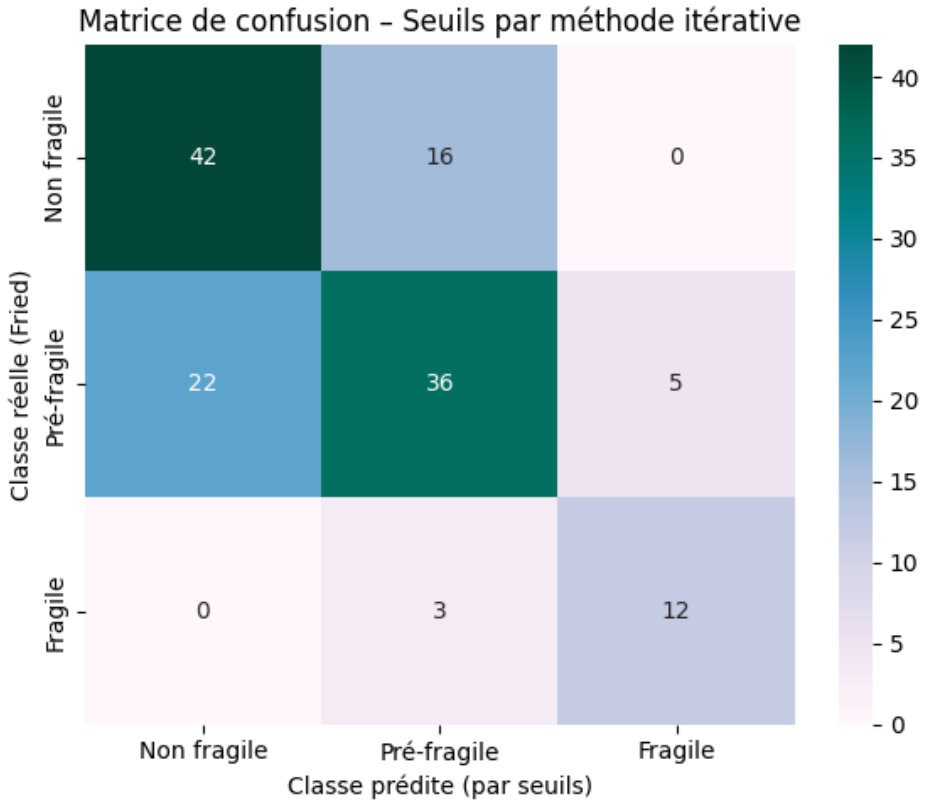
$$\text{SFDFM} \leq 8 \Rightarrow \text{Non-frail}$$

$$8 < \text{SFDFM} \leq 18 \Rightarrow \text{Pre-frail}$$

$$\text{SFDFM} > 18 \Rightarrow \text{Frail}$$

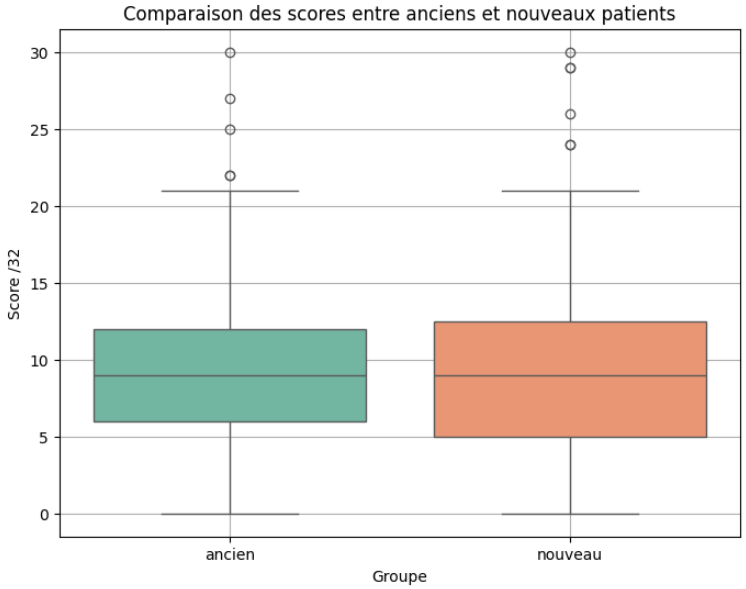
Why:

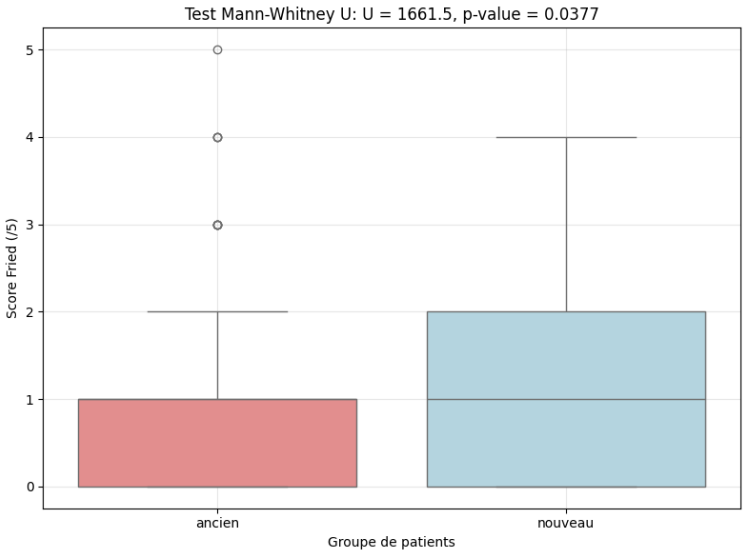
- High accuracy ($\approx 66\%$)
- Strong frail detection (Se $=$ 0.80, Sp $=$ 0.96)



Comparability Analysis Between Patient Groups

Boxplots of Scores by Patient Group





Statistical Test Results

Score	Test	p-value
SFDFM (/32)	Mann–Whitney U	0.9123
Fried (/5)	Mann–Whitney U	0.0377

SFDFM: no significant difference.
Fried: significant difference.

Summary & Perspectives

- Improved and digitized the SFDFM interface
- Identified the most important variables
- Defined thresholds (8 and 18) for classification
- SFDFM works well but is less sensitive than Fried
- Next: test on larger cohorts, compare with other validated scores (SPPB, Clinical Frailty Scale), and add missing dimensions (e.g., fatigue, weight loss)

Thank you for your attention!

Questions?

Application available here:
`https://depistage-fragilite-motrice-1363f3377112.herokuapp.com/`

University of Strasbourg – 2025

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