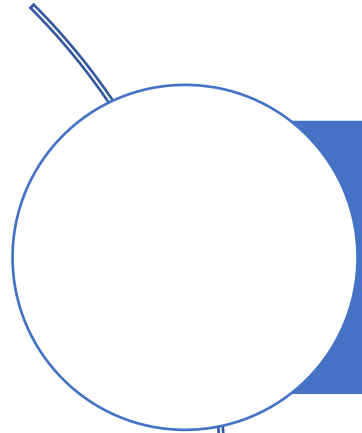
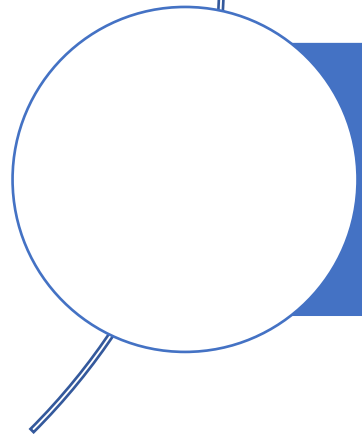


A custom dashboard for insurance agents

Recommender Systems - *Characteristics*



Supervised learning problem



Suggests interest items to the user

Recommender Systems - *Typology*

Content Based

- Knowledge Base
- Cosine similarity

Collaborative Filtering

- Memory Based (neighborhood)
- Model Based

Hybrid

- Combination of Content Based and Collaborative Filtering

Recommender System – *Collaborative filtering Model Based*



Matrix Users-Items

SVD – Singular Value Decomposition Matrix

Latent Factor

Recommender System – *Matrix Users-items*

	i_1	i_2	i_3	i_4	i_5	i_6
u_1		5			3	
u_2	1			3		4
u_3		2			2	
u_4	4			3		
u_5		4	3			5

«**A**» is a matrix of rank ($m \times n$)

«**M**» indicates the users of systems

«**N**» indicates the items of systems

«**A**[i, j]», $1 \leq i \leq m$, $1 \leq j \leq n$ indicates the preference value of user i for item j

Recommender System – *SVD Singular Value Decomposition*

$$A = U\Sigma V^T$$

A

- Initial users-items matrix

U

- Matrix with the first K vectors relating to users

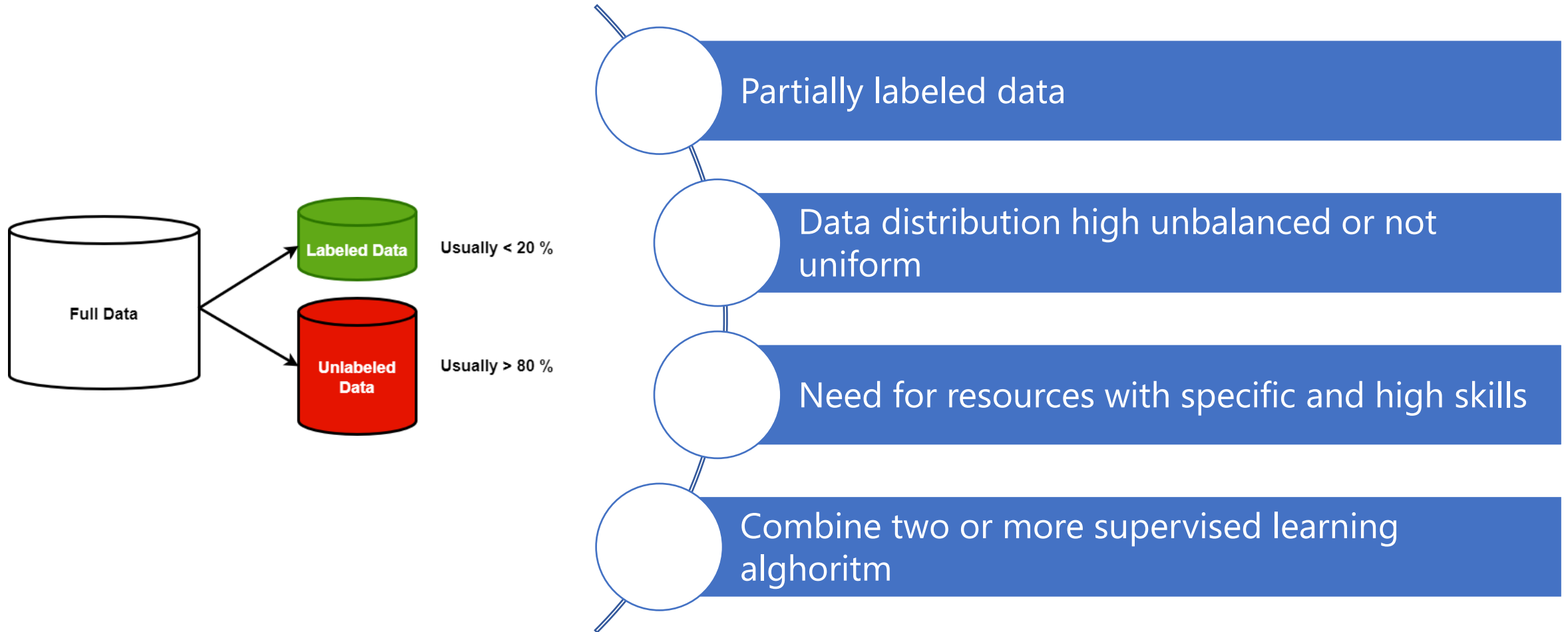
Σ

- Diagonal matrix with increasing values $\sigma_1 \leq \sigma_2 \leq \dots \leq \sigma_n$ ($i = 1..n$)

V^T

- Transposed matrix with the first H vectors relating to items

Recommender System – Semi-supervised learning



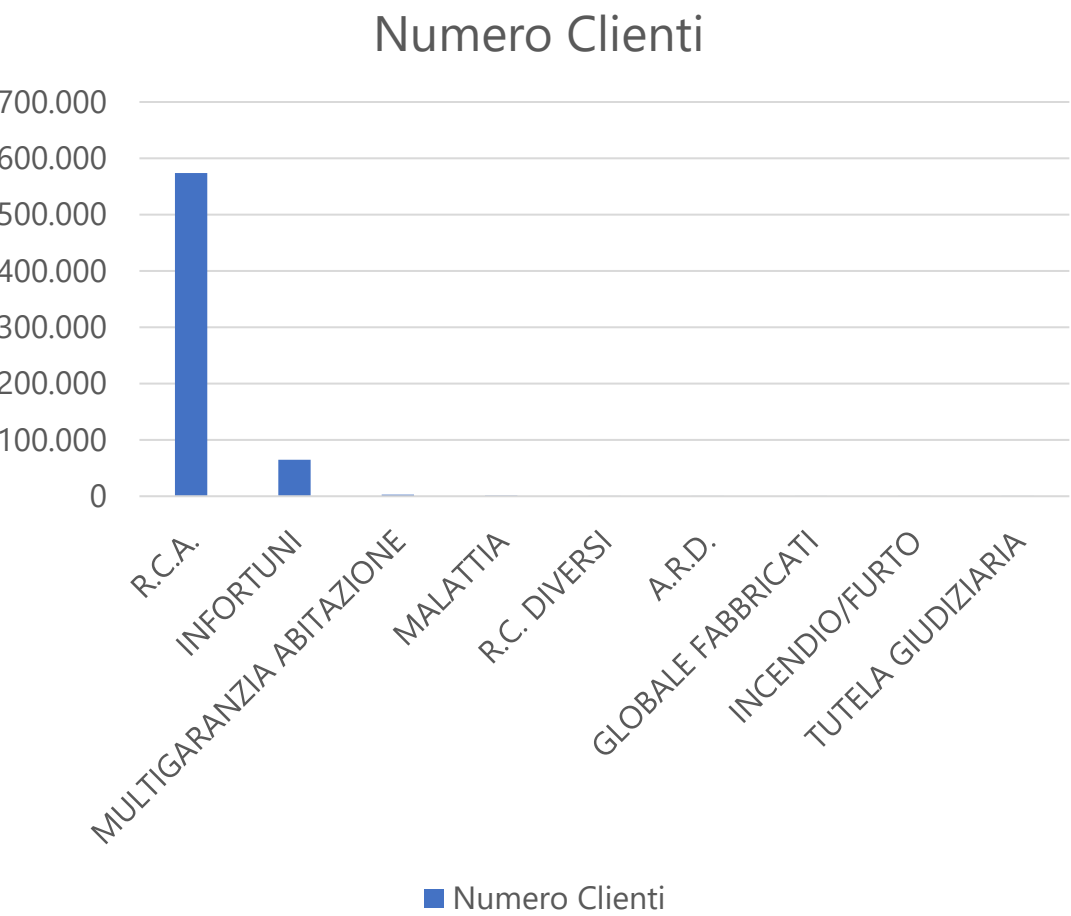
Recommender System – *Semi-supervised Hybrid approach*

A is a high
sparse matrix

A is very
unbalanced
matrix

Missing
explicit rating
value

Recommender System – *Distribution Items*



Nome Polizza	Numero Clienti	Percentuale
R.C.A.	573.876	89,4675
INFORTUNI	64.266	10,0191
MULTIGARANZIA ABITAZIONE	2.413	0,3762
MALATTIA	766	0,1194
R.C. DIVERSI	78	0,0122
A.R.D.	22	0,0034
GLOBALE FABBRICATI	8	0,0012
INCENDIO/FURTO	4	0,0006
TUTELA GIUDIZIARIA	2	0,0003

Recommender System – *Semi-supervised Hybrid approach*

Starting point

- Sparse Matrix > 85 %
- Unbalanced Matrix
- Missing explicit rating value



Define knowledge base

- Features of the articles
- Features of the users



Content boosted

- Calculate the forecast value for all items for all users
- Change the scale for all ratings, *I used the percent scale*
- Add random bias to all ratings value

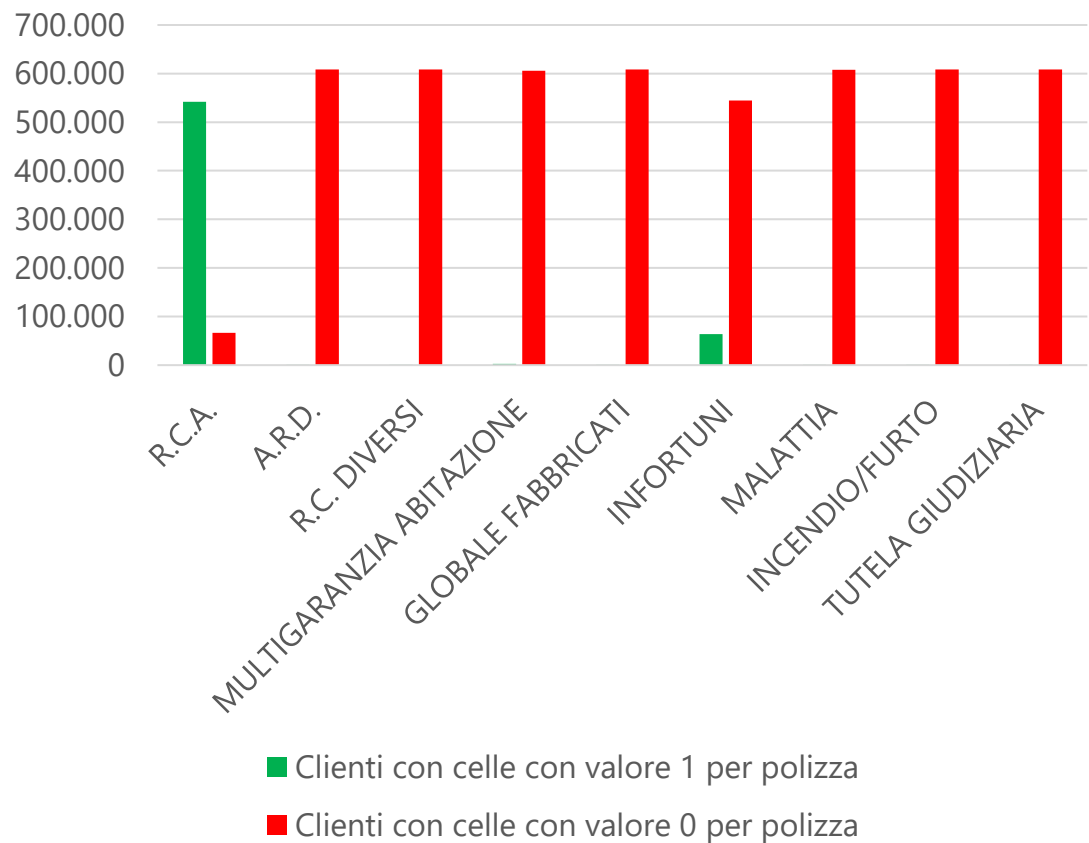


Improve recommendations

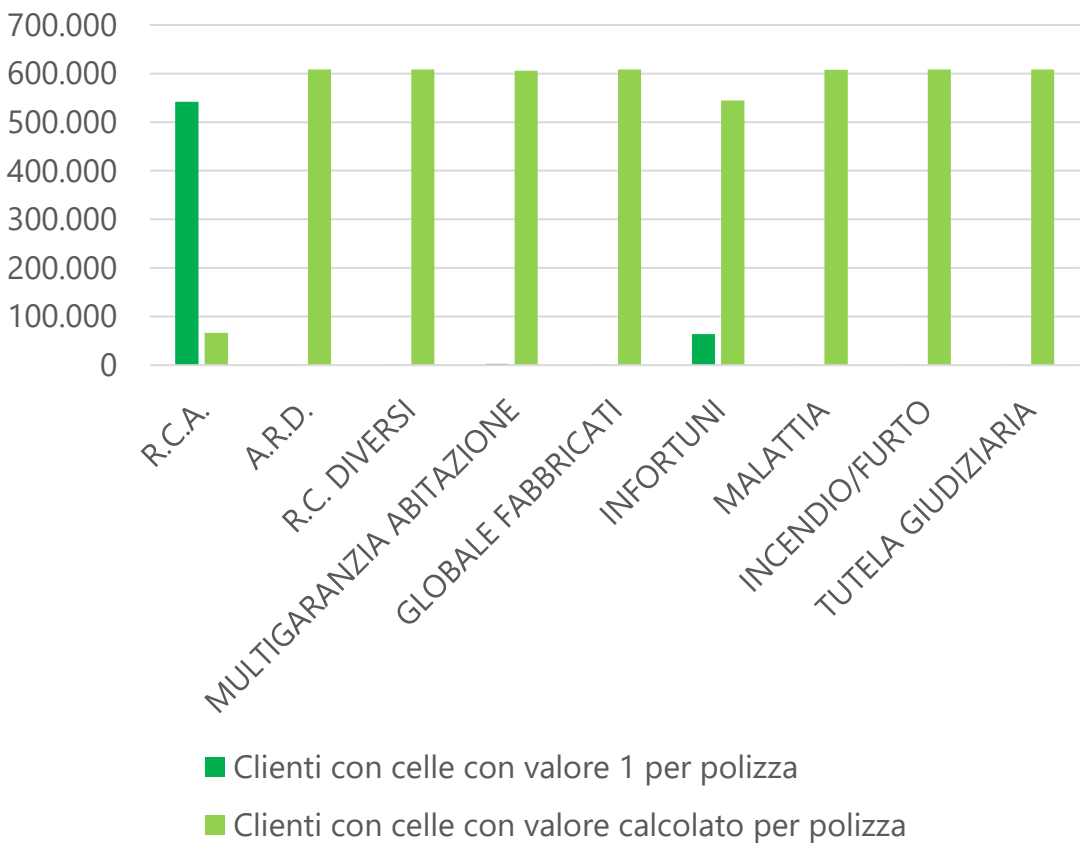
- Initial value of MSE is $\leq 0,5$
- Final value of MSE is $> 0,9$

Recommender System – *Experimental results compared*

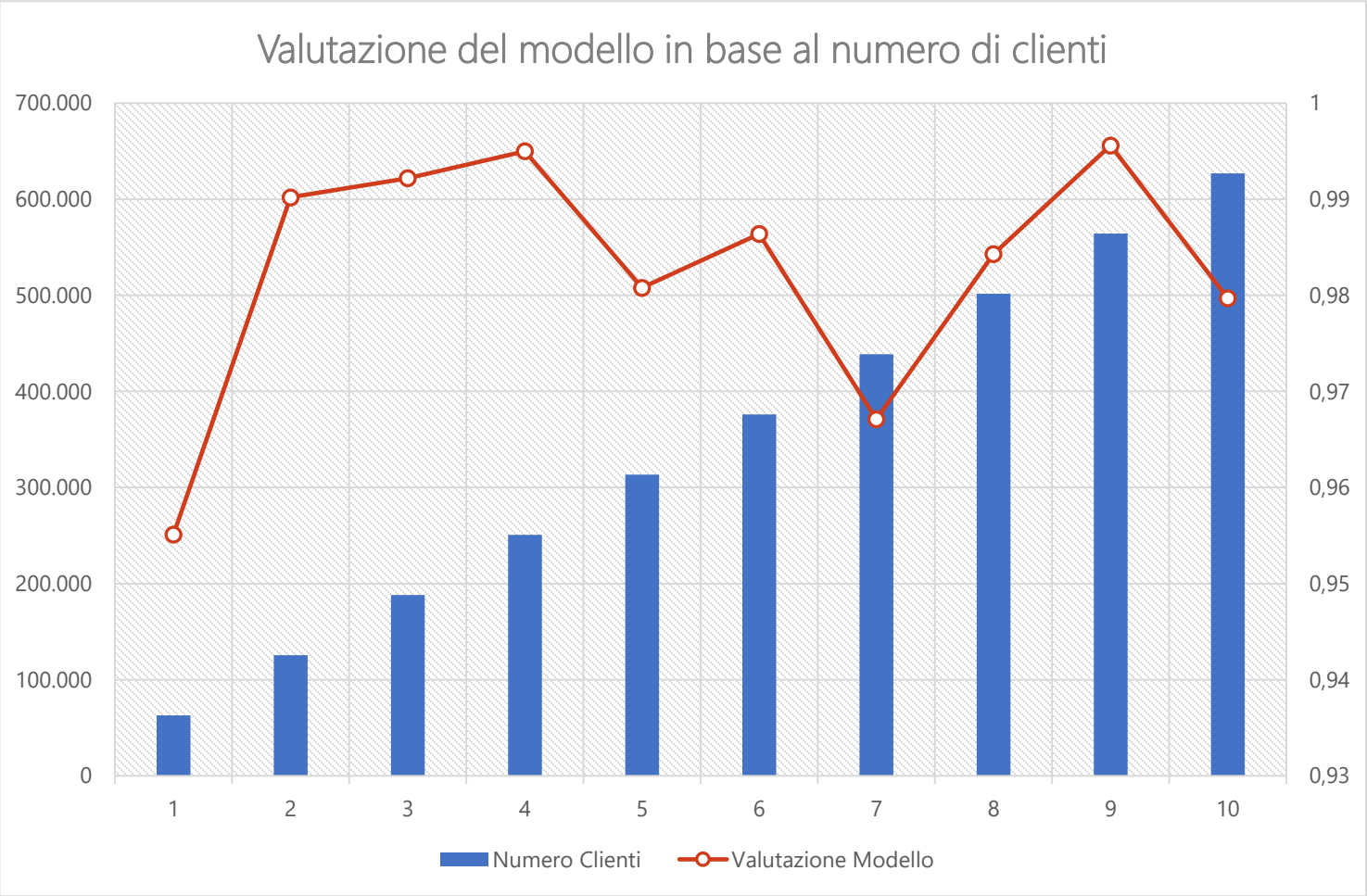
Matrix Users-Items – *Initial distribution*



Matrix Users-Items – *Final distribution*



Recommender System – *Experimental results valuation*



Numero Clienti	Valutazione Modello
62.693	0,9551
125.386	0,9902
188.079	0,9922
250.772	0,9951
313.465	0,9808
376.158	0,9864
438.851	0,9671
501.544	0,9843
564.237	0,9956
626.929	0,9797