

28TH NOVEMBER 2025/26

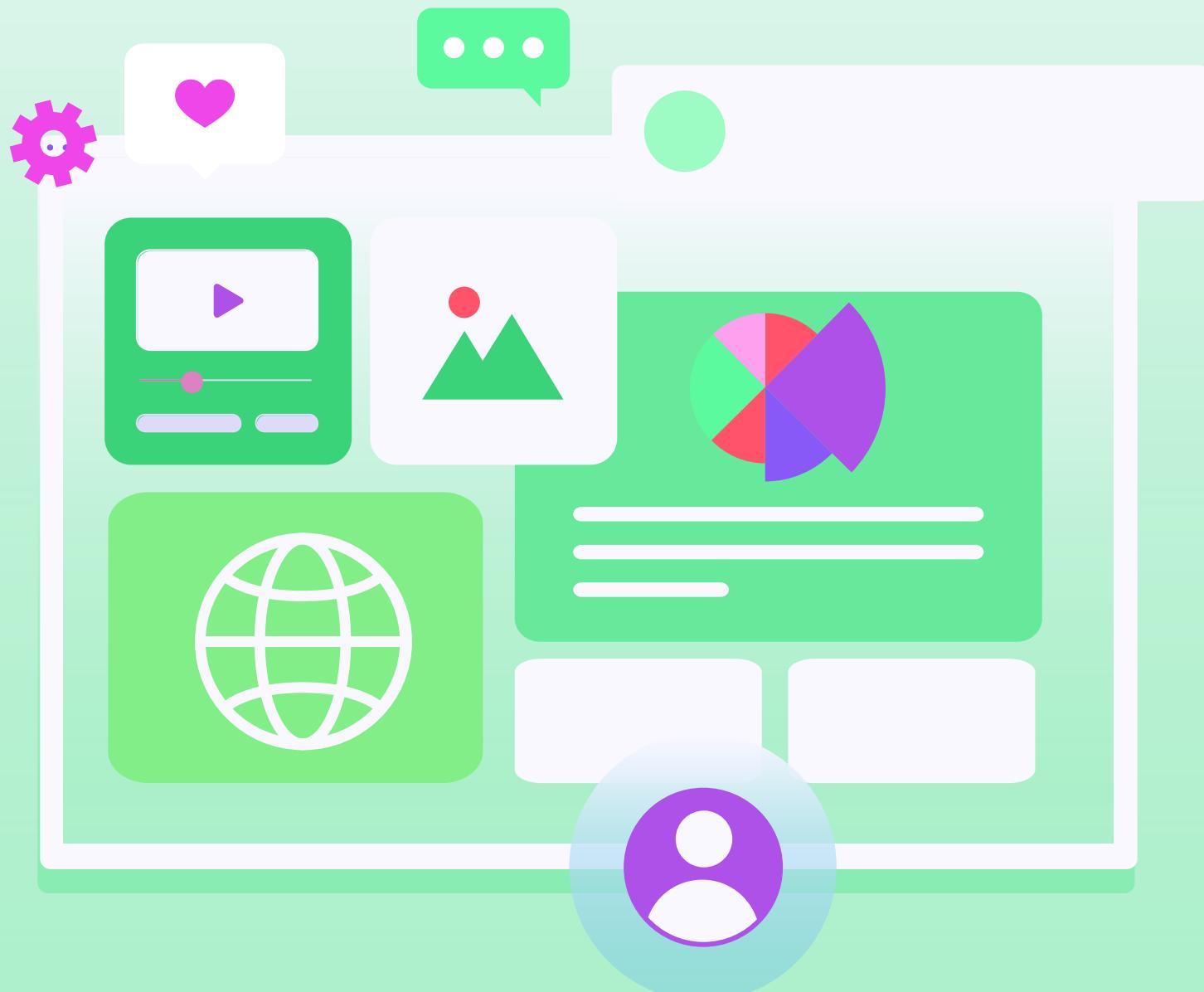
Voice-Controlled Excel Management System

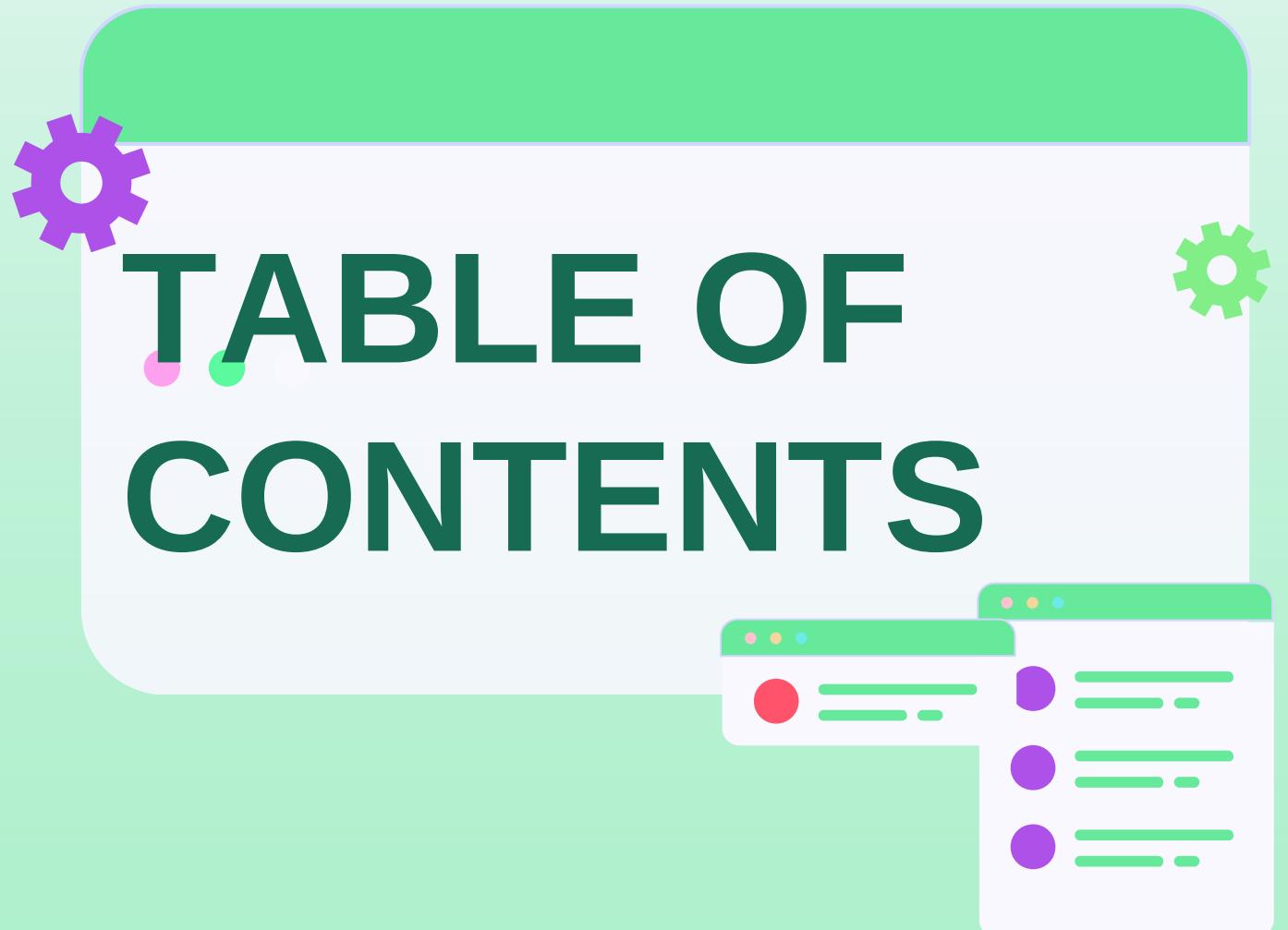
Multimodal Interaction

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telecomunicações e informática





01 Introduction

- Persona
 - Why we decided to develop this project
 - Our Idea & Goals

02 Technical Implementation

- Tools used

03 Implemented Intents

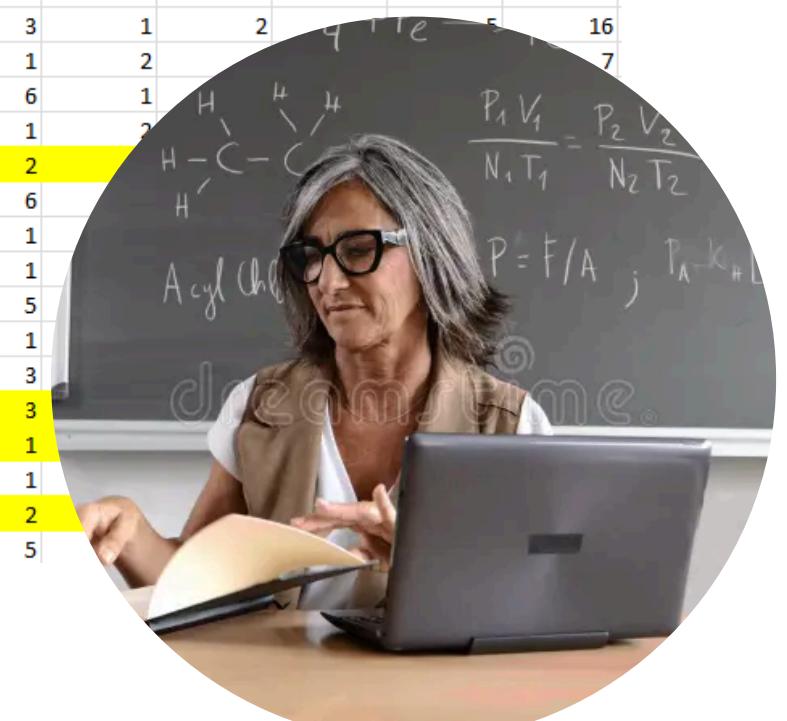
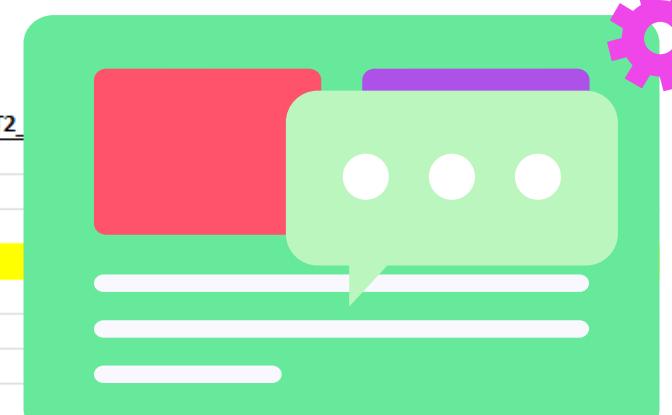
04 Demo

05 Challenges & Conclusion

02 Introduction Persona

- **Name:** Prof. Helena Martins
- **Age:** 58 years old
- **Field:** Social Sciences / Education
- **Experience:** 30 years of university teaching
- **Digital Skills:** Intermediate (uses email, Moodle, and PowerPoint, but avoids advanced tools)

necano	Nome	preço de e-digo de cui	digo de cui	TP	P	REGIME	Teste 1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19
107447	MARIA INÉS maria.ines	8314	TP2	P1a	O		13																		
94716	ANA CATA acatarinafu	8246	TP1	P8	O		8																		
107135	MARIANA marianam	8314	TP2	P2	O		11																		
107390	MARIA JOSE mariaforte	8314	NO_TP				11																		
108121	DANIELA ILIANA dani.teles	8314	TP1	P10	O		15																		
107242	JOANA MCGEOHAN joanamms	8314	TP1	P7	O		17																		
108589	JOANA GOMES joana.inac	8314	TP2	P6	O		11																		
108522	JOSÉ PEDRO jpaabreu@	8315	TP1	P7	O		13																		
107218	EDUARDA eduardaca	8314	TP2	P5	O		10	2	2	0	7	2	1	1	2	5	4	1	1	4	1	5	2	13	
108189	JOSÉ PEDRO gasparbarl	8314	TP2	P2	O		12	1	1	2	5	4	1	2	5	5	2	5	5	2	1	4	1	16	
107372	ELIANA PEREIRA eliana.bet	8314	TP2	P2	O		15	6	4	1	5	2	1	2	5	5	2	5	5	2	5	5	2	18	
108957	DIOGO GOMES diogo.gcar	8314	TP1	P8	O		14	1	1	5	2	1	2	5	5	2	5	5	2	5	5	2	5	2	
107440	PEDRO GOMES gab.oliveira	8314	TP2	P1	O		16	5	1	2	5	5	1	2	5	5	2	5	5	2	5	5	2	15	
108188	JOÃO MATOS joamat22	8314	TP2	P1	O		16	1	2	1	2	1	2	1	2	5	5	2	5	5	2	5	5	7	
108855	MARIANA marianagn	8314	TP1	P8	O		18	2	1	7	1	1	2	5	5	2	5	5	2	5	5	2	5	15	
108672	MARIANA marianaco	8314	TP1	P8	O		9	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	
108138	DIOGO MACHADO diogo.orfa	8314	TP2	P1	O		14	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	16	
107236	BEATRIZ MARQUES beatriz.afc	8314	TP1	P8	O		15	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	7	
104204	ALEXANDRA alexander	8307	TP1	P8	O		15	6	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	7	
107428	INÊS MARTINS i.melo@u	8314	TP1	P10	O		16	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	7	
107259	DANIEL FILHO daniel.mo	8314	TP1	P10	O		9	2																	
100088	MARIA MACHADO maria.cast	8307	TP2	P1	O		13	6																	
108506	CAROLINA carolinaca	8314	TP2	P1	O		17	1																	
110376	RICARDO FIGUEIREDO rfigueired	8314	TP2	P1	O		16	1																	
109038	MARTA BORGES martabdg	8314	TP1	P10	O		17	5																	
108727	JOÃO PEDRO joaorolo03	8314	TP1	P10	O		12	1																	
93973	CATARINA MARTINS cdmartins	8307	TP1	P10	O		11	3																	
108381	MARIANA marianale	8314	TP1	P10	O		8	3																	
108694	MIGUEL XAVIER miguelxlr	8314	TP1	P10	O		11	1																	
108421	AFONSO MARQUES afonso.marques.a	8314	TP2	P1	O		13	1																	
108366	LEONOR MARQUES leonor.ma	8314	TP1	P10	O		8	2																	
109462	JOÃO HENRIQUE joaohenriq	8314	TP1	P10	O		10	5																	



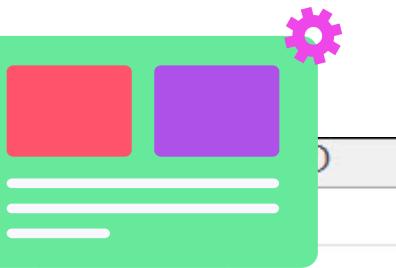
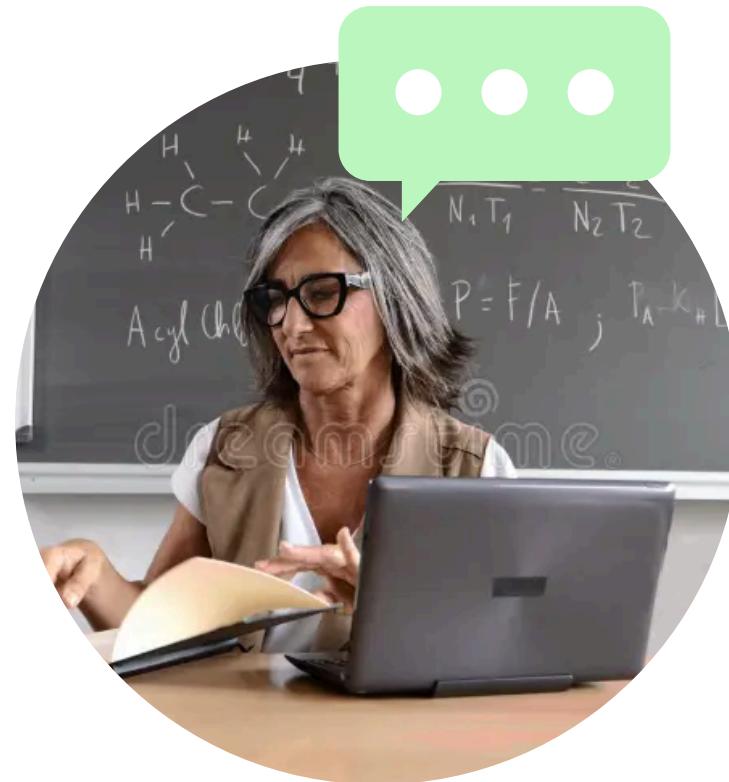
02 Introduction Persona

- **Difficulty using advanced Excel features**

- Difficulty calculating averages
- Difficulty applying conditional formatting
- Difficulty generating charts
- Difficulty creating pivot tables
- Particularly struggles with writing and understanding formulas

- **Fear of causing errors in the spreadsheet**

- She feels insecure when working in Excel, mainly because she is afraid of accidentally deleting important data or altering the layout or structure of the sheet,



A	B	C	D
1		Jan	
2	Entertainment		
3	Cable TV	52.98	52.98
4	Video Rentals	7.98	11.97
5	Movies	16.00	32.00
6	CDs	18.99	29.99
7	Totals	=SUM(B3:B6)	
8			

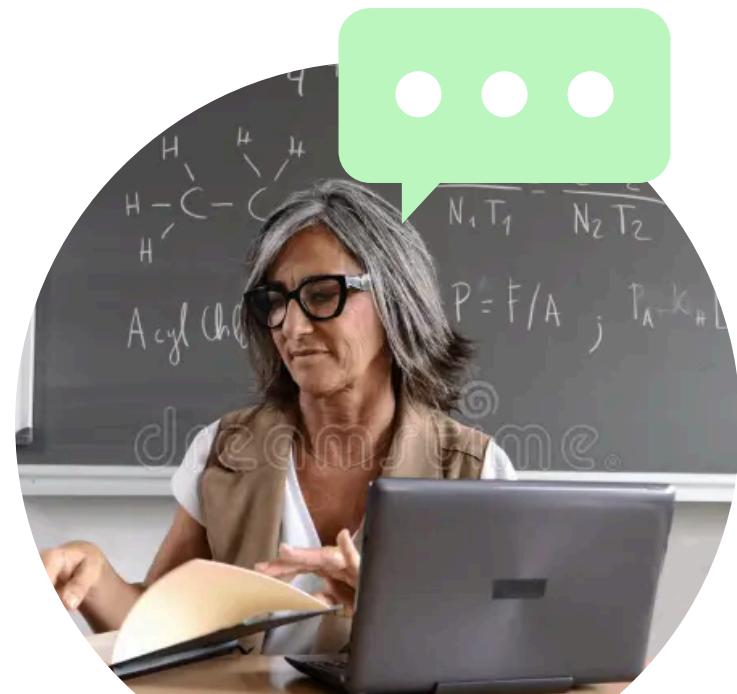
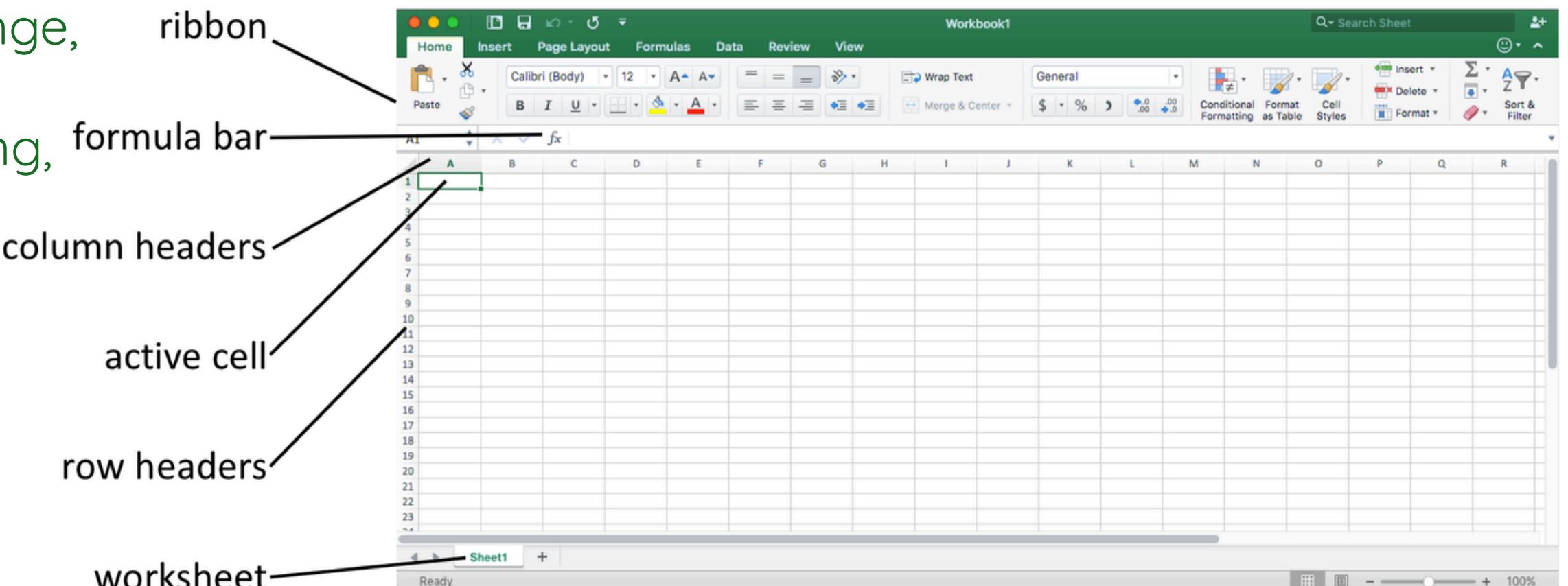


02 Introduction Persona

- Difficulty understanding Excel's technical vocabulary

Common Excel terminology is not intuitive for her, including:

- column, row, cell, range, ribbon
- pivot table,
- conditional formatting,
- bar chart.



02 Goals

- **1. Automate Excel tasks**

Minimize manual navigation and formula creation.

- **2. Improve processing efficiency**

Speed up repetitive and time-consuming operations.

- **3. Enable natural language interaction.**

Allow simple, intuitive commands without technical terms.

- **4. Support hands-free use**

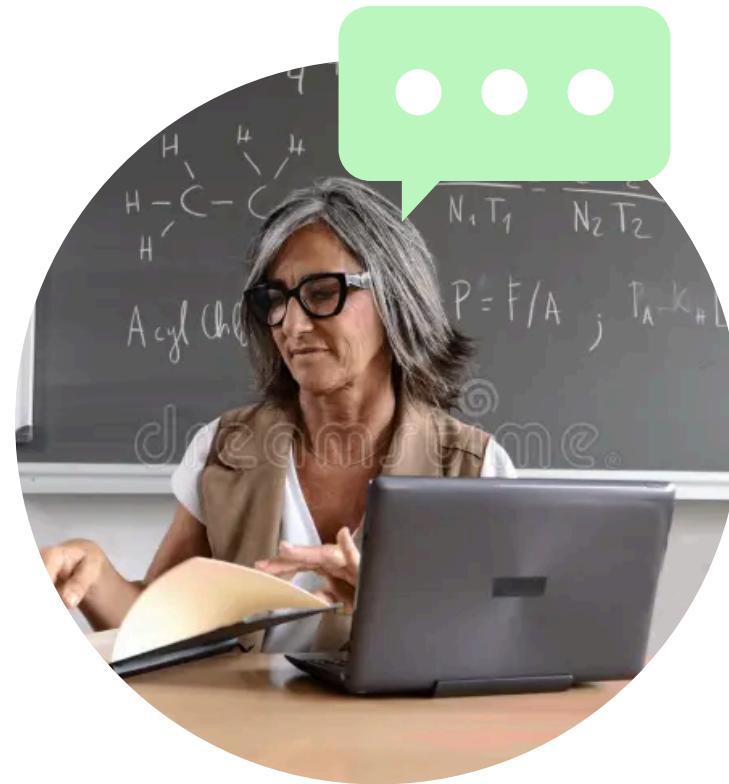
Facilitate multitasking during teaching and evaluation

- **5. Increase accessibility**

Assist users with low digital or Excel proficiency

- **6. Reduce manual errors**

Ensure accurate calculations through automation.



02 Technical Implementation

NLU

RASA

Natural language processing to interpret voice commands



Fusion Engine

MMI Framework



Tools

Backend

Microsoft Office
Excel Interop
C#



Support

- Lookup Tables
- Regex Entities



03 Implemented Intents



Calculate Average

Commands

- “Calcula a média da turma”
- “Calcula a média do aluno X”
- “Qual a média do aluno número X”
- “Faz a média dos testes”

Feedback

- “Média calculada.”
- “Média calculada para X.”



Highlight Passed / Failed

Commands

- “Destaca aprovados e reprovados”
- “Pinta de verde quem passou”
- “Realça os reprovados”

Feedback

- “Situação atualizada com sucesso.”



03 Implemented Intents



Insert Columns

Commands

- “Insere a coluna Situação”
- “Criar coluna [nome]”
- “Adicionar coluna do teste 1/2/3...”

Feedback

- “Coluna criada com sucesso”



Show Real Improvement

Commands

- “Quem melhorou?”
- “Mostra evolução dos testes”
- “Quem teve maior progresso?”

Feedback

- “Melhoria Real atualizada”



03 Implemented Intents



Insert Test Questions



Show Possible Improvement

Commands

- “Adicionar perguntas ao teste 1”
- “Criar perguntas do teste 3”
- “Adicionar P1 a P5 para o teste 5”



Feedback

- “Perguntas adicionadas.”

Commands

- “Mostrar MP”
- “Quem ainda pode recuperar?”
- “Quem tem hipótese?”

Feedback

- “Melhoria possível aplicada com sucesso”



03 Implemented Intents



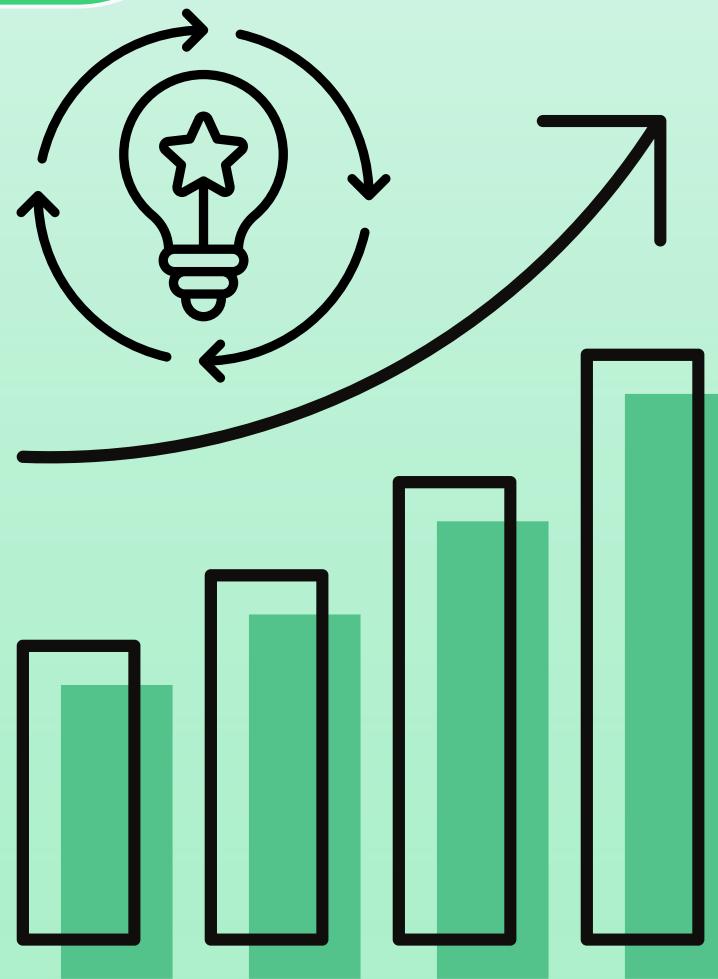
Generate Class Chart

Commands

- “Gera gráfico da turma”
- “Mostra evolução das médias”
- “Cria gráfico de desempenho”

Feedback

- “Gráfico criado.”



Generate Student Bar Chart

Commands

- “Gráfico de barras do aluno número X”
- “Faz gráfico da aluna Maria”
- “Mostrar notas do aluno João”

Feedback

- “Gráfico de barras criado para o aluno X.”





03 Implemented Intents



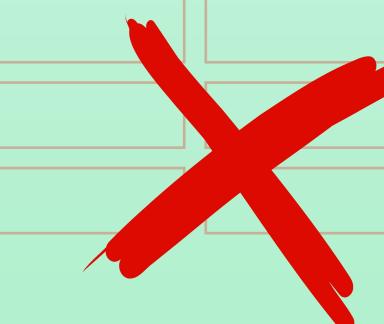
Test Questions Chart



Delete All Charts

Commands

- “Gráfico das perguntas do teste 2”
- “Mostra T2_P1 a T2_P5”
- “Comparar perguntas do teste 2”



Feedback

- “Gráfico das perguntas do teste 2 criado.”

Commands

- “Apaga todos os gráficos”
- “Limpa os gráficos da folha”

Feedback

- “Todos os gráficos apagados.”





03 Implemented Intents



Update Grades

Commands

- “Atualiza a nota da pergunta 1 do aluno X para 3”
- “Altera as notas para 2 4 5 3 1”
- “Muda o teste 2 para 15”

Feedback

- “Notas atualizadas com sucesso.”



Class Statistics

Commands

- “Quantos aprovados existem?”
- “Qual a média geral da turma?”
- “Estatísticas gerais”
- “Resumo das notas”

Feedback

- “Tabela dinâmica criada com sucesso!”

03 Implemented Intents



Save File

Commands

- “Guarda o ficheiro como Relatorio.xlsx”
- “Salvar documento”

Feedback

- “Relatório guardado.”



Help / Show Commands

Commands

- “O que posso pedir?”
- “Ajuda”
- “Mostra a lista de comandos”

Feedback

- “Aqui estão as funcionalidades disponíveis...”



03 Implemented Intents



Create Pivot Table



Commands

- “Cria uma tabela dinâmica”
- “Pivot por regime”
- “Pivot com Nome nas linhas e Média nos valores”

Feedback

- “Tabela dinâmica criada com sucesso!”

Pivot Table 1

Sales		Sep	Oct	Nov	Total
Apples	250	590		840	
John		180		180	
Mike		120		120	
Pete		290		290	
Sally	250			250	
Bananas		430	600	1030	
John		400	400		
Mike		200	200		
Pete		180	180		
Sally		250	250		
Cherries	580	910		1490	
John		250		250	
Mike	250	330		580	
Pete		330		330	
Sally	330			330	
Oranges		120	720	840	
John		120	120		
Mike		400	400		
Pete		120	120		
Sally		200	200		
Total		830	2050	1320	4200

Pivot Table 2

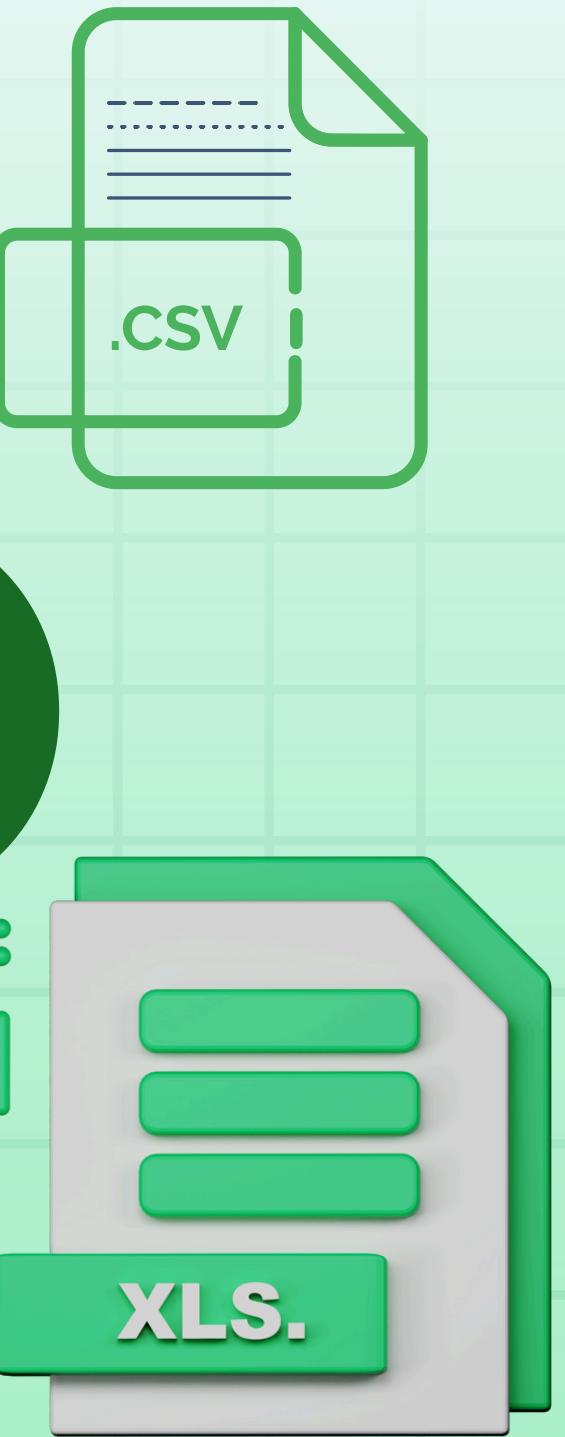
Month	(All)					
Sales	Product					
Reseller	Apples					
John		\$180	\$400	\$250	\$120	\$950
Mike		\$120	\$200	\$580	\$400	\$1,300
Pete		\$290	\$180	\$330	\$120	\$920
Sally		\$250	\$250	\$330	\$200	\$1,030
Total		\$840	\$1,030	\$1,490	\$840	\$4,200

Pivot Table 3

Product	(All)					
Sales	Month					
Reseller	Sep					
John			\$430	\$520	\$950	
Mike		\$250		\$450	\$600	\$1,300
Pete				\$920		\$920
Sally		\$580	\$250	\$200	\$1,030	
Total		\$830	\$2,050	\$1,320	\$4,200	



04 DEMO



05 Challenges & Conclusion

Challenges

- **1. Natural Language Understanding in Portuguese**

Difficulty handling the wide variability of user phrasing.

- **2. Accurate Extraction of Excel Entities**

Complexity in reliably identifying columns like “Average”, “Test 1”, and “REGIME”.

- **3. Rasa → Excel Integration.**

Ensuring consistent execution of intents and correct operations in the spreadsheet.

- **4. Building Pivot Tables**

Challenge in coordinating rows, values, and filters correctly.

- **5. Complex Interconnection of All Components**

Combining NLU, Rasa, Excel automation, and entity extraction into a unified system.



05 Challenges & Conclusion

Conclusion

- Voice commands made Excel interaction **more dynamic and accessible.**
- Learned new Excel features, **including pivot tables and automation.**
- Improved understanding of NLU, entity extraction, and Rasa workflows.
- System **successfully** supports users with low digital literacy.
- **Future work:** add more functionalities to enhance accessibility and usability.





THANK YOU!

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