

# **User Manual**

Version 1.0.0

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# 1 Introduction

This is the user guide for the PCBR recommender. There are two ways of using the software, through a command line interface (CLI) or with a graphical user interface (GUI). Both of the methods require an equivalent setup.

## 2 Directory Structure

From the root folder, the **data** folder contains the initial case base library, additional information tables for the components and the feature scalers' and normalizers' parameters in the file **feature\_scalers.json**. Additionally, the **feature\_relevance.csv** matrix is located in that folder. This file contains the contribution of each of the user's preferences to each of the features used by the system.

The **interface** directory contains the PyQt5 files for running the application's GUI. The **src** folder contains all the code required for the core PCBR application to run in an interactive shell as well as the code underlying the algorithms used for both the CLI and the GUI. Finally, the **test** folder contains unit test files.

## 3 Setup

The application was developed in a **python3.6** environment on MacOS and Linux and those operating systems are strongly recommended. It has been spot-checked to run on Windows, but some cross-platform incompatibilities in the PyQt bindings cause the GUI to freeze at times. The required packages can be found in the **requirements.txt** file located in the root directory of the software package. A conda environment is highly encouraged. First create and activate the environment with the commands in Listing 1 and install the required packages using the commands in Listing 2. The commands in the latter listing will install all of the dependencies.

```
1 conda create --name pcbr python=3.6
2 conda activate pcbr
```

Listing 1: Instructions to create the conda environment

```
1 python -m pip install --upgrade pip
2 pip install -r requirements.txt
```

Listing 2: Instructions to install dependencies in environment

## 4 GUI

The GUI for the project can be run from the root directory of the software with the following command:

```
1 python interface/welcomeWindow.py
```

Note that running the GUI requires a shell with display capabilities and the package PyQt5, previously installed according to the instructions in Listing 2. The *welcomeWindow.py* file additionally allows the user to specify an alternative CBL file in csv format,

similar to *data/pc\_specs.csv*, using the “-c” option.

When the start button is pressed, the user is prompted with a window with 3 tabs and a **Done** button. The tabs correspond to the **Basic**, **Preferences** and **Advanced** as shown in 2, 3 and 4, respectively. In the figures, we show the empty questionnaire on the left and an example of a filled-in questionnaire on the right. The Done button will be inactive until all the fields have been filled in correctly.

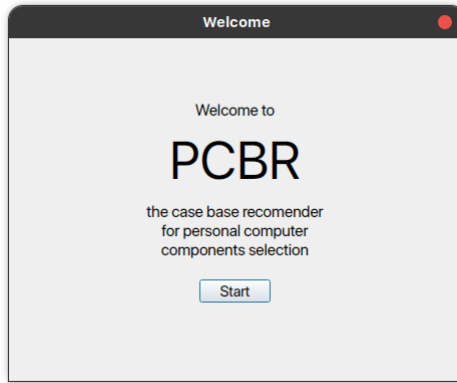


Figure 1: Welcome window

**User Profile - Basic (Empty)**

- What is your experience level with computers?
  - ☐ They scare me
  - ☐ Novice
  - ☐ Intermediate
  - ☐ Expert
  - ☐ My name is Linus Torvalds
- Are you currently working from home?
  - ☐ Yes
  - ☐ No
- What is the primary use of this computer?
  - ☐ Machine Learning programming
  - ☐ Home/casual use
  - ☐ Other programming
  - ☐ Work
  - ☐ Gaming
  - ☐ Graphics/music/video production
- What is your budget?
  - ☐ Low
  - ☐ Medium
  - ☐ High
- How frequently do you replace your computer?
  - ☐ 1-2 years
  - ☐ 2-5 years
  - ☐ 5-7 years
  - ☐ 7-10 years
- Do you need an optical drive?
  - ☐ Yes
  - ☐ No

**User Profile - Basic (Filled)**

- What is your experience level with computers?
  - ☐ They scare me
  - ☐ Novice
  - ☐ Intermediate
  - ☒ Expert
  - ☐ My name is Linus Torvalds
- Are you currently working from home?
  - ☒ Yes
  - ☐ No
- What is the primary use of this computer?
  - ☒ Machine Learning programming
  - ☐ Home/casual use
  - ☐ Other programming
  - ☐ Work
  - ☐ Gaming
  - ☐ Graphics/music/video production
- What is your budget?
  - ☐ Low
  - ☐ Medium
  - ☒ High
- How frequently do you replace your computer?
  - ☐ 1-2 years
  - ☒ 2-5 years
  - ☐ 5-7 years
  - ☐ 7-10 years
- Do you need an optical drive?
  - ☐ Yes
  - ☒ No

Figure 2: Empty and full Basic page

**User Profile - Preferences (Empty)**

How important is each of the following items to you?

	Not at all	Little	Somewhat	Rather	Very
Budget	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multi-tasking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gaming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Streaming videos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Editing photos/music	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast startup/shutdown	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Video chat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which applications do you run?

- ☐ Microsoft Office Suite
- ☐ TensorFlow/PyTorch/Keras
- ☐ Compilers
- ☐ High-performance games: Resident Evil Village, Witcher 3, World of Warcraft, Red Dead Redemption
- ☐ Low-performance games: Minecraft, Fortnite: Battle Royale
- ☐ Photoshop
- ☐ Videochat

Max. budget:

**User Profile - Preferences (Filled)**

How important is each of the following items to you?

	Not at all	Little	Somewhat	Rather	Very
Budget	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Multi-tasking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Gaming	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Streaming videos	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Editing photos/music	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast startup/shutdown	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Video chat	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which applications do you run?

- ☒ Microsoft Office Suite
- ☒ TensorFlow/PyTorch/Keras
- ☒ Compilers
- ☒ High-performance games: Resident Evil Village, Witcher 3, World of Warcraft, Red Dead Redemption
- ☐ Low-performance games: Minecraft, Fortnite: Battle Royale
- ☐ Photoshop
- ☒ Videochat

Max. budget:

Figure 3: Empty and full Preferences page

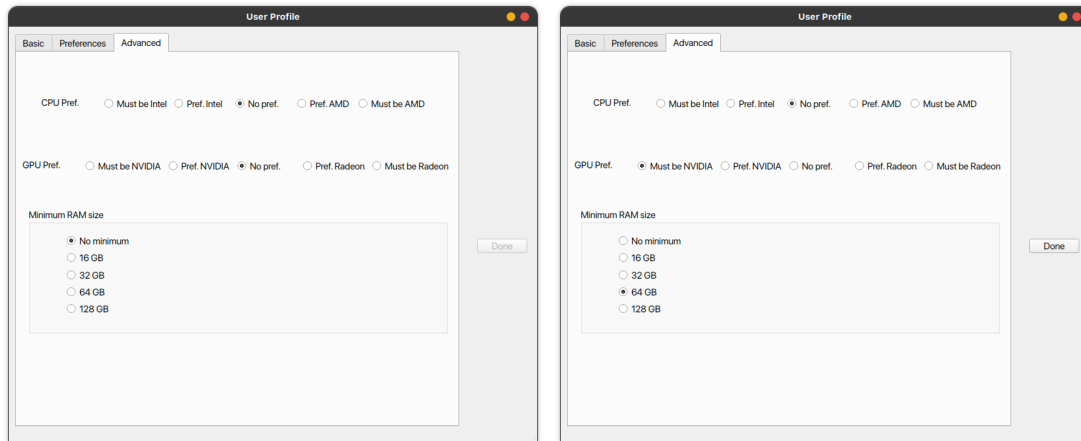


Figure 4: Default and full Advanced page

After the user has filled in the questionnaire and pressed the done button, they are prompted with a solution. The user can decide if it is acceptable or not and decide if they want to change any component as shown in Figure 5.

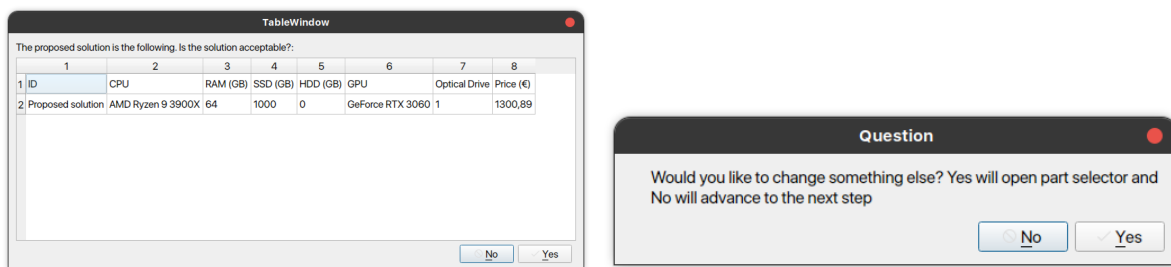


Figure 5: Proposed solution and question window

Then, the user is prompted with a window to choose the component to change and immediately after, the component that they would like to substitute it with. This process is shown in Figure 6.

After the user has selected the component to be replaced, they are prompted with all the solutions up to this point and asked if they would like to change anything else. If the user selects yes, they are taken back to the component selection stage (where they will not see the components that have already been modified). If the user selects no or all components have been changed, the user is asked to choose between the proposed solutions as shown in Figure 7.

Finally the user is shown the selected instance 8 and returned to the main questionnaire window.

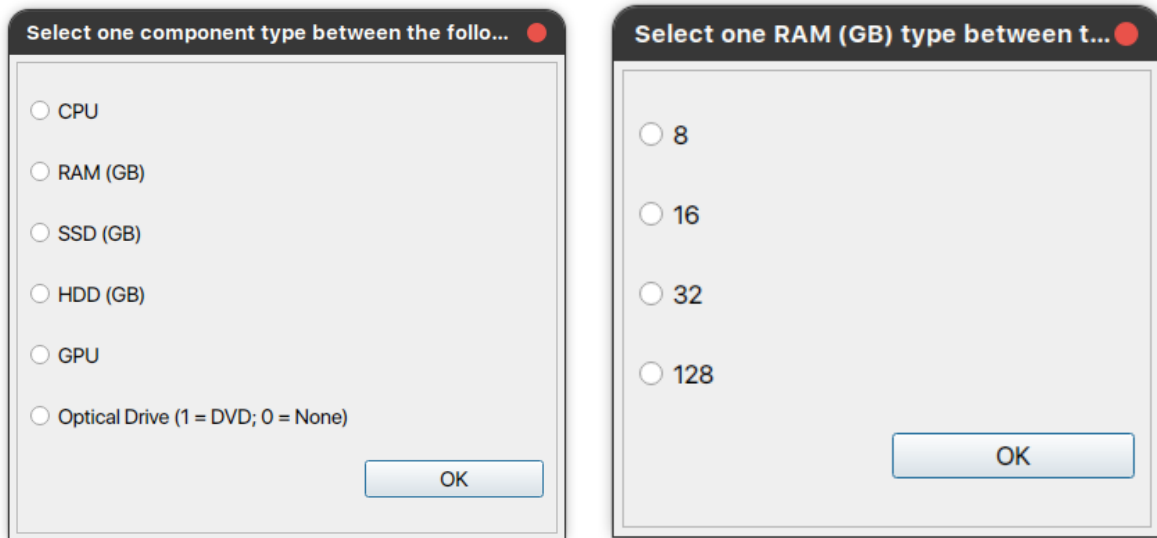


Figure 6: Component type and value selection

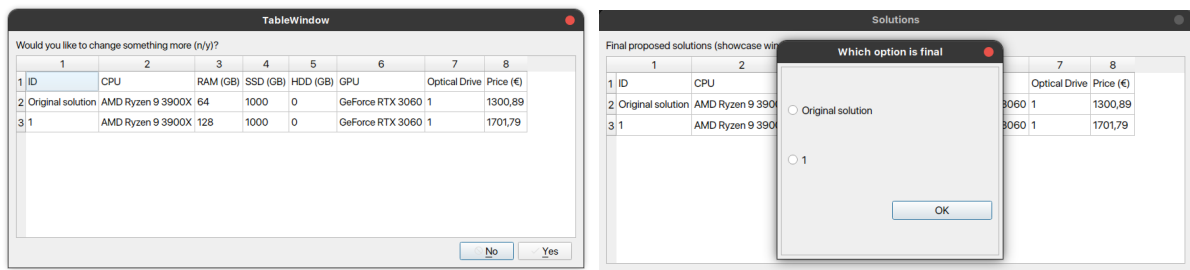


Figure 7: Change something else and final selection

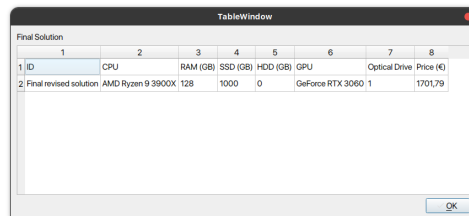


Figure 8: Final showcase

## 5 CLI

To run the software through CLI<sup>1</sup>, the following command has to be run from the **src** directory:

```
1 python pcbr.py
```

The *pcbr.py* file additionally allows the user to specify an alternative CBL file in csv format, similar to *data/pc\_specs.csv*, using the “-c” option. The “-g” option will generate 10000 random entries into a csv in *data/generator.csv* to evaluate the time response of the system as well as the evolution of the number of retained instances. Once the program has been started, a prompt will come up asking the user to input a series of

<sup>1</sup>While possible to run through the CLI, the team recommends running through the GUI for the best, most intuitive experience

values as shown in Figure 9. At this prompt, or any of the 3 data input stages, the string **exit** can be used to exit the program. The input for this first prompt must be in the order of Table 1, separated by commas:

position	name	type and range
1	Experience	int $\in \{1, 2, 3, 4\}$
2	Work from Home status	int $\in \{0, 1\}$
3	Primary use	string $\in \{\text{Home, Gaming, Production, Programming, ML, Work}\}$
4	Budget	int $\in \{1, 2, 3\}$
5	Replacement frequency	int $\in \{1, 2, 3, 4\}$
6	Office	int $\in \{0, 1\}$
7	Photoshop	int $\in \{0, 1\}$
8	Video Chat	int $\in \{0, 1\}$
9	ML	int $\in \{0, 1\}$
10	Compilers	int $\in \{0, 1\}$
11	High-Performance Games	int $\in \{0, 1\}$
12	Low-Performance Games	int $\in \{0, 1\}$

Table 1: Table of user profile features

```
INFO:pcbr:Initializing...
INFO:pcbr:Initialization complete!
input profile (12 comma separated values i.e. 2, 1, Programming, 1, 3, 1, 0, 0, 0, 1, 0, 0):
█
```

Figure 9: Profile input prompt

Once the user profile has been entered into the system, the preferences are requested following a similar format to the user profile. The prompt appears as shown in Figure 10. The values entered should reflect the importance of a given feature to the user and should be entered in the order in Table 2.

```
input preferences (13 comma separated values i.e. 5, 2, 3, 1, 2, 1, 3, 4, 1, 0, 1, 0, 0):
█
```

Figure 10: Preferences input prompt

Once the user preferences are entered, the user is prompted for constraints, as shown in Figure 11. The values must be entered in a key:value pair, comma-separated string as shown in the example.

```
input constraints (key:value pairs i.e. cpu_brand: PreferIntel, gpu_brand: AMD, min_ram: 32, max_budget: 1500):
█
```

Figure 11: Constraints input prompt

After all the data has been entered, the user is prompted with a proposed solution and asked if the solution is satisfactory or not as shown in Figure 12. If the user considers that the solution is satisfactory, the program will skip to the step which displays the final revised solution, as depicted in Figure 18. If the user does not consider the solution good enough, they are directed to the next step.

If the user decides that the proposed solution is not satisfactory, the program will ask if the user would like to change any component of the configuration as shown in Figure 13.

position	name	type and range
1	Budget	int $\in \{1, 2, 3, 4, 5\}$
2	Performance	int $\in \{1, 2, 3, 4, 5\}$
3	Multi-tasking	int $\in \{1, 2, 3, 4, 5\}$
4	Gaming	int $\in \{1, 2, 3, 4, 5\}$
5	Streaming videos	int $\in \{1, 2, 3, 4, 5\}$
6	Editing videos/photos/music	int $\in \{1, 2, 3, 4, 5\}$
7	Fast startup/shutdown time	int $\in \{1, 2, 3, 4, 5\}$
8	Video chat	int $\in \{0, 1\}$
9	Microsoft Office Suite	int $\in \{0, 1\}$
10	Tensorflow, PyTorch, Keras	int $\in \{0, 1\}$
11	Compilers	int $\in \{0, 1\}$
12	High-performance games	int $\in \{0, 1\}$
13	Low-performance games	int $\in \{0, 1\}$

Table 2: Table of preferences

```

*****
*****      EXPERT OPINION      *****
*****
|-----| CPU |-----| RAM (GB) |-----| SSD (GB) |-----| HDD (GB) |-----| GPU |-----| Optical Drive (1 = DVD; 0 = None) |-----| Price (€) |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Proposed solution | Intel Core i5-11600K | 32 | 250 | 1000 | Radeon RX 580 | 1 | 881.92 |
Is the latter proposed solution satisfactory (y/n)?

```

Figure 12: Proposed solution prompt

```

Would you like to change any components (y/n)? (n will drop the solution)

```

Figure 13: Component question prompt

If the user chooses to change a component, the program asks which one they would like to change as shown in Figure 14. The selection is performed with a numeric index input. If a component has already been changed, it will not appear in this list.

```

Select one component number between the following ones:
0 - CPU
1 - RAM (GB)
2 - SSD (GB)
3 - HDD (GB)
4 - GPU
5 - Optical Drive (1 = DVD; 0 = None)

```

Figure 14: Component selection prompt

Once the component has been selected, the user is asked which value they would like to use instead of the one previously selected, as can be observed in Figure 15. Selection is carried out using a numeric integer value from the given list.



```

-----
All possible values for the component are the following:

| | RAM (GB) |
|---:|-----:|
| 0 | 8 |
| 1 | 16 |
| 2 | 64 |
| 3 | 128 |

What component would you like to use instead of "32.0"?

```

Figure 15: Component value selection prompt

Once the component has been chosen, the user is shown all of the partially-modified solutions up to this point and is asked if they would like to change another component as shown in Figure 16. If the user chooses to change another component, they are prompted with the component question again. If the user chooses to not change anything else, they are prompted with the final selection stage as in Figure 17 to select which of the solutions they would like to keep.

```

What component would you like to use instead of "32.0"?
2
| | CPU | RAM (GB) | SSD (GB) | HDD (GB) | GPU | Optical Drive (1 = DVD; 0 = None) | Price (€) |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| Original solution | Intel Core i5-11600K | 32 | 250 | 1000 | Radeon RX 580 | 1 | 801.92 |
| 1 | Intel Core i5-11600K | 64 | 250 | 1000 | Radeon RX 580 | 1 | 997.49 |

Would you like to change something more (y/n)?

```

Figure 16: All solutions display prompt

```

Would you like to change something more (y/n)?
n
| | CPU | RAM (GB) | SSD (GB) | HDD (GB) | GPU | Optical Drive (1 = DVD; 0 = None) | Price (€) |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| Original solution | Intel Core i5-11600K | 32 | 250 | 1000 | Radeon RX 580 | 1 | 801.92 |
| 1 | Intel Core i5-11600K | 64 | 250 | 1000 | Radeon RX 580 | 1 | 997.49 |

Which configuration do you want to keep? (Select a configuration number)

```

Figure 17: Final selection prompt

Finally, the revised solution is shown to the user along with info about the retention of the case. This prompt is shown in 18.

```

Which configuration do you want to keep? (Select a configuration number)
1
*****
EXPERT OPINION END
*****
| | CPU | RAM (GB) | SSD (GB) | HDD (GB) | GPU | Optical Drive (1 = DVD; 0 = None) | Price (€) |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| Final revised solution | Intel Core i5-11600K | 64 | 250 | 1000 | Radeon RX 580 | 1 | 997.49 |
*****
The proposed solution has NOT been stored!

```

Figure 18: Final revised solution display