Supplementary Material for the Paper Machine Learning for Utility Prediction in Argument-Based Computational Persuasion"

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Appendix A: Simulation Results on the Single Trees

Figures 1 and 2 show some examples of performance of $\mathrm{SimDialogue}_{\mathrm{ML}}$ for single pairs $\langle T, \mathcal{U}^o_T \rangle$ of a decision tree T and a dataset $\mathcal{U}^o_T$. Each marked point represents the average of the metric over the k folds with the corresponding standard deviation. The x axis contains the evidence, that is, the number of asked questions that ranges from 1 to $|\mathsf{leaves}(T)| - 1$ for the decision tree T. As discussed for the aggregated results in the main paper, SVR obtains the best results with bigger evidence whereas CRAMER achieves reasonable performance with a low amount of evidence.

Appendix B: Decision Tree for the Red Meat Case Study

Figure 3 shows the decision tree for the red meat consumption case study. For the sake of readability, we removed the decision/chance nodes and left only the labeling: argument id and text. In red the initial persuasion goal. The corresponding `json` and `csv` files are shared with the code for reproducing the experiments.

Appendix C: Decision Tree Topics and Synthetic Users Profiles for the Red Meat Case Study

Here the DT topics and the user profiles. The corresponding `csv` file is shared with the code for reproducing the experiments. The DT topics:

Vegetarianism: root-leaf paths with the majority of the arguments suggesting vegetarianism, $U^p(n) = 8$.

Fish as alternative: root-leaf paths with the majority of the arguments suggesting fish consumption, $U^p(n) = 6$.

White meat as alternative: root-leaf paths with the majority of the arguments suggesting white meat consumption, $U^p(n) = 4$.

Thinking to alternatives: root-leaf paths with the majority of the arguments suggesting alternatives to the usual diet habits, $U^p(n) = 3$.

Slow red meat reduction: root-leaf paths with the majority of the arguments suggesting to reduce red meat slowly, $U^p(n) = 2$.

The user profiles:

Profile 1: Middle-aged man, employed, university degree, high meat consumption, low physical activity. Highly interested in reducing red meat and consuming white meat instead. Low interest in other alternatives such as vegetarianism. He does not like fish.

Profile 2: Young man (from 20 to 25), employed, high-school degree, high meat consumption, low physical activity. Mild interest in reducing red meat, low interest in all the other alternatives.

Profile 3 Young university student (from 20 to 25), high meat consumption, high physical activity. Low interest in just reducing red meat and other alternatives. He mildly likes fish, he really likes white meat.

Profile 4: Woman (from 30 to 40), employed, Ph.d., regular meat consumption, low physical activity. Mildly interested in just reducing red meat and high interest in fish and vegetarian alternatives.

Profile 5: Young man/woman (from 20 to 30), elementary school degree, regular meat consumption, high physical activity. Low interest in just reducing red meat and vegetarian alternatives. He/she likes white meat and fish.

Profile 6: Retired woman, elementary school degree, regular meat consumption, very low physical activity. High interest in reducing red meat and consuming white meat. Low interest in all the other alternatives.

Appendix D: Histograms of the True Nodes for the Red Meat Case Study

Figure 4 presents histograms of the true nodes returned by the $\mathrm{SimDialogue}$ procedure. We can notice that the majority of the true nodes has a proponent utility value of 8. This is not surprisingly as the bimaximax rule tends to select nodes with the highest utility.

Appendix E: Examples of True Nodes Arguments for the Red Meat Case Study

Table 1 shows examples of true arguments returned by the SimDialogue procedure and the predicted arguments returned by CRAMER and SVR procedures, respectively. We also report the relative argument distances from the true argument. CRAMER returns arguments that are more similar (that is, have a lower mean argument distance) to the true ones with respect to SVR.

Profile id	True argument	CRAMER argument	Dist.	SVR argument	Dist.
1	Alternative foods like eggs, cheese, vegetables or mushrooms are affordable too.	You can try alternative foods like eggs, cheese, vegetables or mushrooms.	1	You could add legumes to your diet slowly or try different recipes with them.	3
2	Fish is not always expensive, there exists many cheap fish varieties.	Meat is cheap due to the massive exploitation of natural resources. Buying less meal will help the planet.	2	Beans are rich of iron.	5
3	Fish is not always expensive, there exists many cheap fish varieties.	Alternative foods like eggs, cheese, vegetables or mushrooms are affordable too.	2	You can try with white meat that is healthier and easy to cook.	5
4	Legumes are a good source of alternative proteins.	You can try alternative foods like eggs, cheese, vegetables or mushrooms.	0	Fish is not always expensive, there exists many cheap fish varieties.	3
5	Alternative foods like eggs, cheese, vegetables or mushrooms are affordable too.	You can try alternative foods like eggs, cheese, vegetables or mushrooms.	0	Fish is not always expensive, there exists many cheap fish varieties.	2
6	Fish is not always expensive, there exists many cheap fish varieties.	Fish is not always expensive, there exists many cheap fish varieties	0	You can try with white meat that is healthier and easy to cook.	4

Table 1: Examples of true and predicted arguments, one for each profile. CRAMER returns arguments that are more similar to the true ones with respect to SVR.

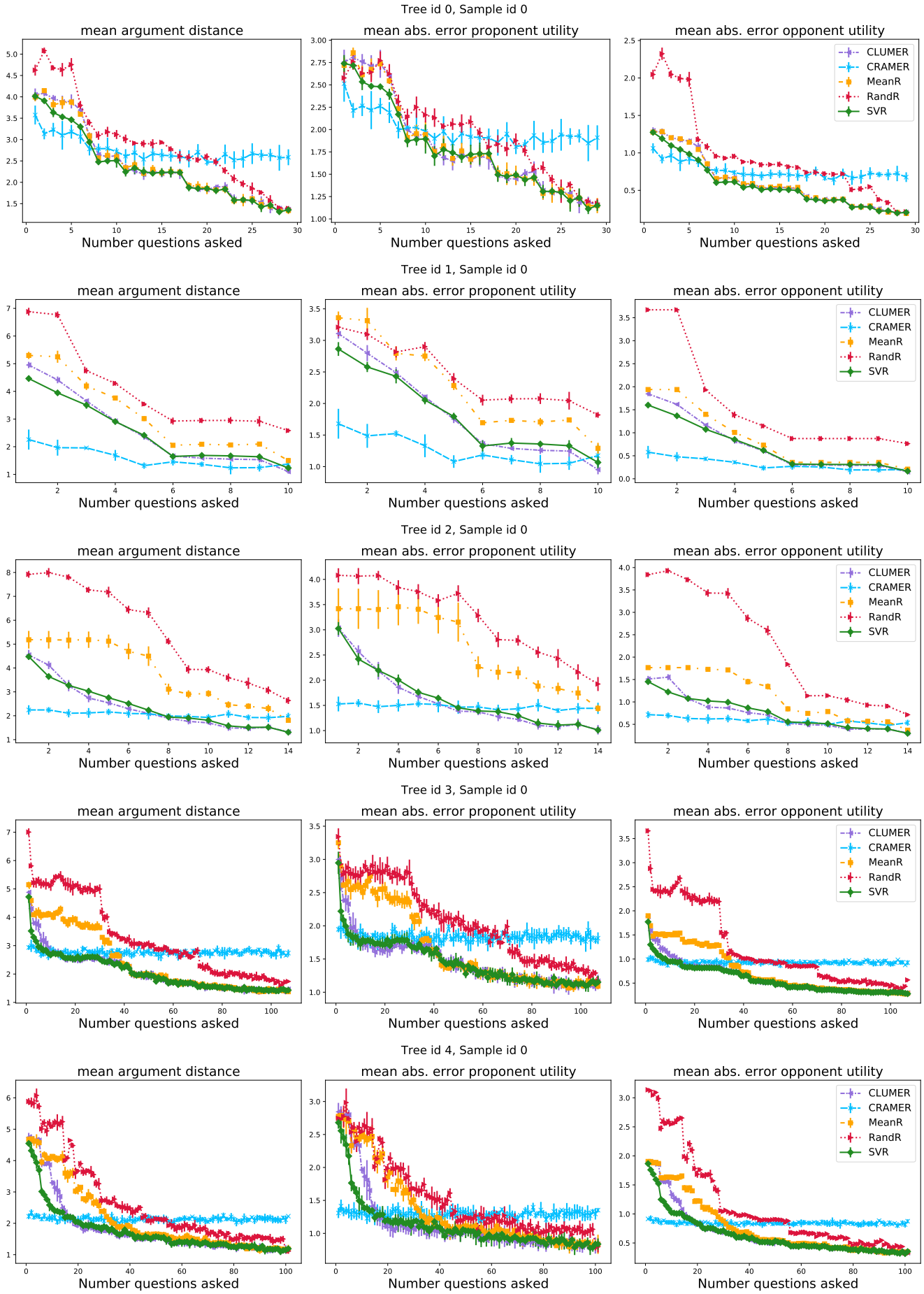

Figure 1: Examples of performance of $\mathrm{SimDialogue}_{\mathrm{ML}}$ for single pairs $\langle T, \mathcal{U}_T^o \rangle$ of a decision tree and a dataset. Trees with id from 0 to 4. Best viewed in colors.

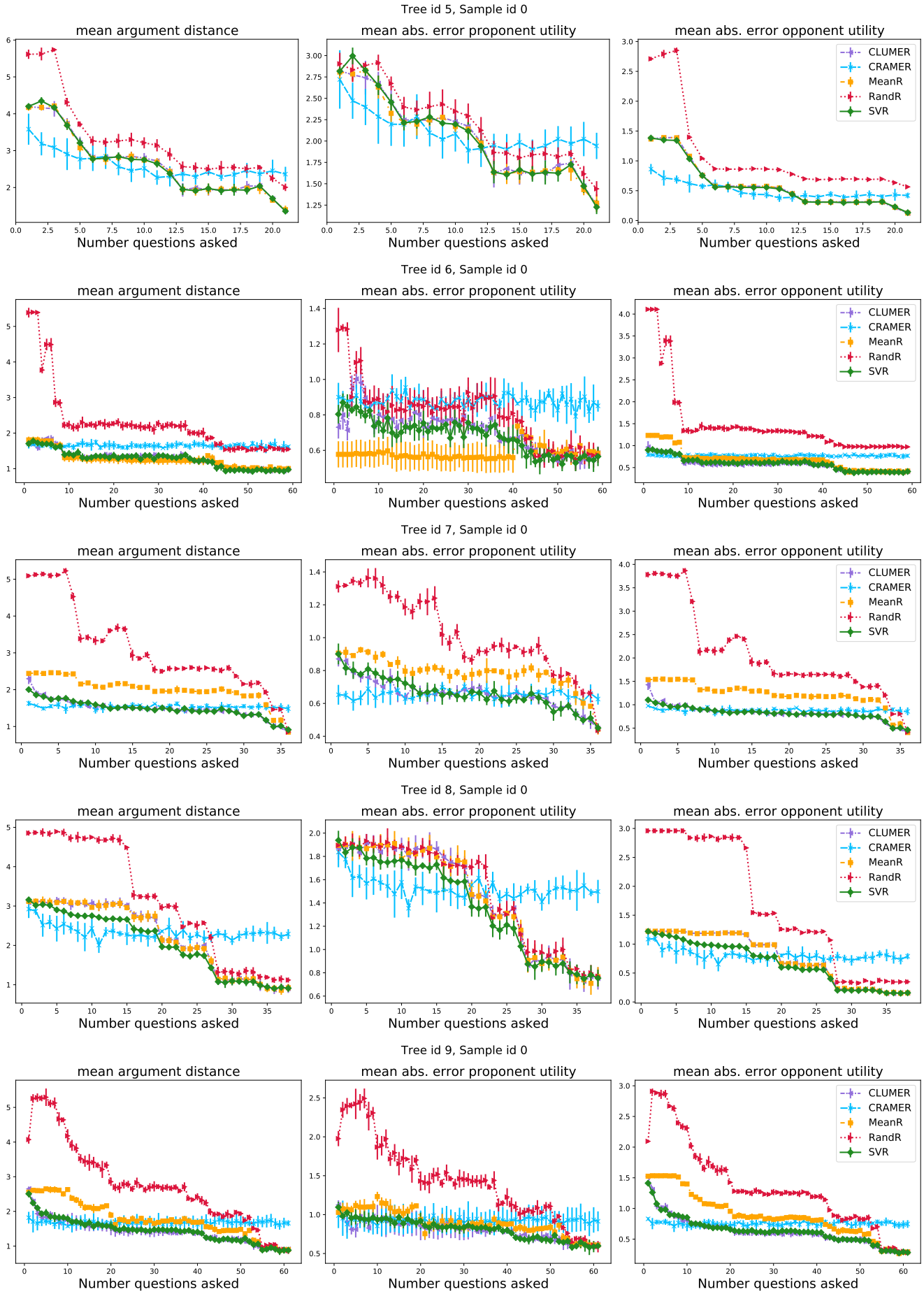

Figure 2: Examples of performance of $\mathrm{SimDialogue}_{\mathrm{ML}}$ for single pairs $\langle T, \mathcal{U}_T^o \rangle$ of a decision tree and a dataset. Trees with id from 5 to 9. Best viewed in colors.

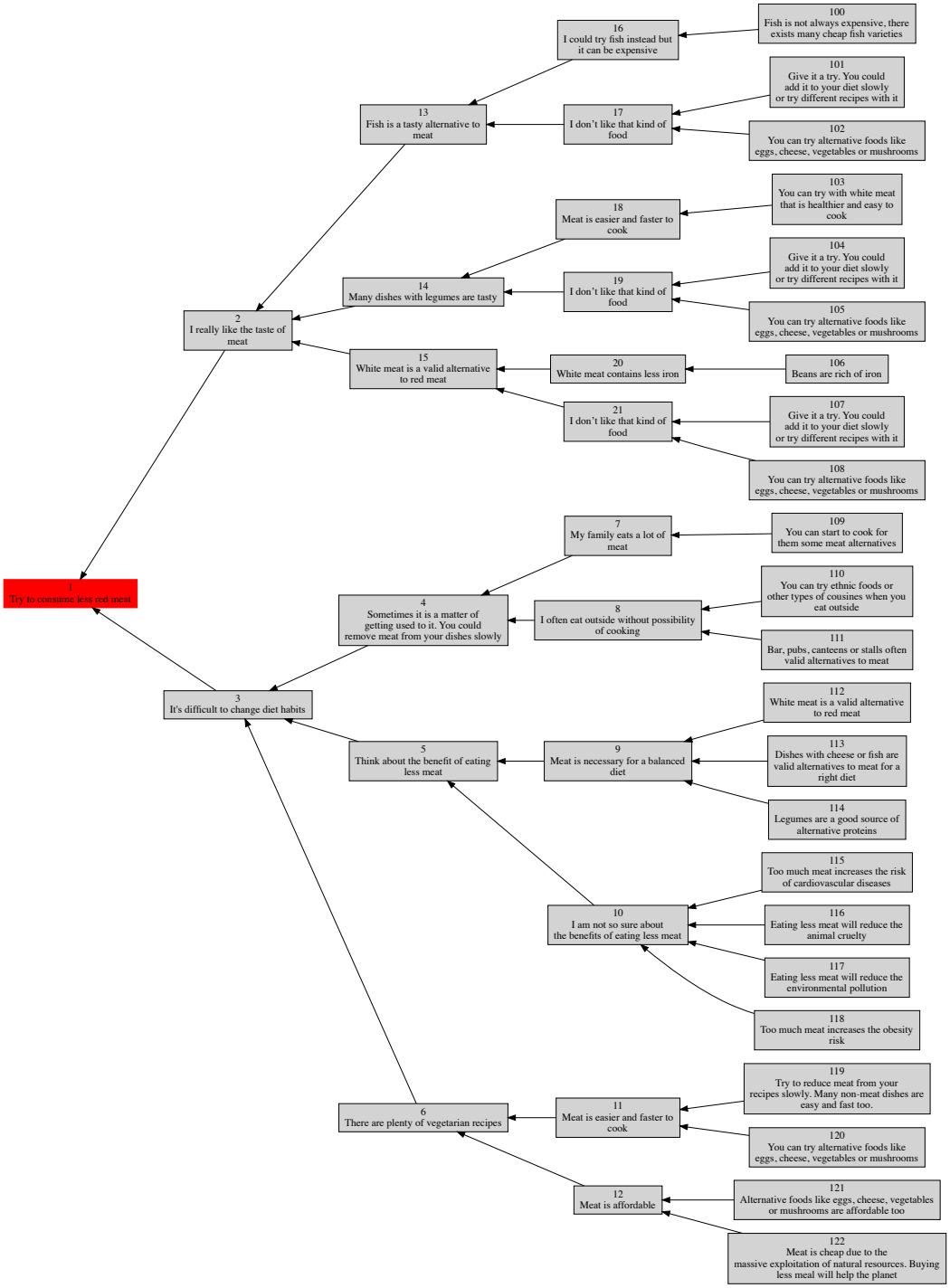

Figure 3: Decision tree for the red meat consumption case study.

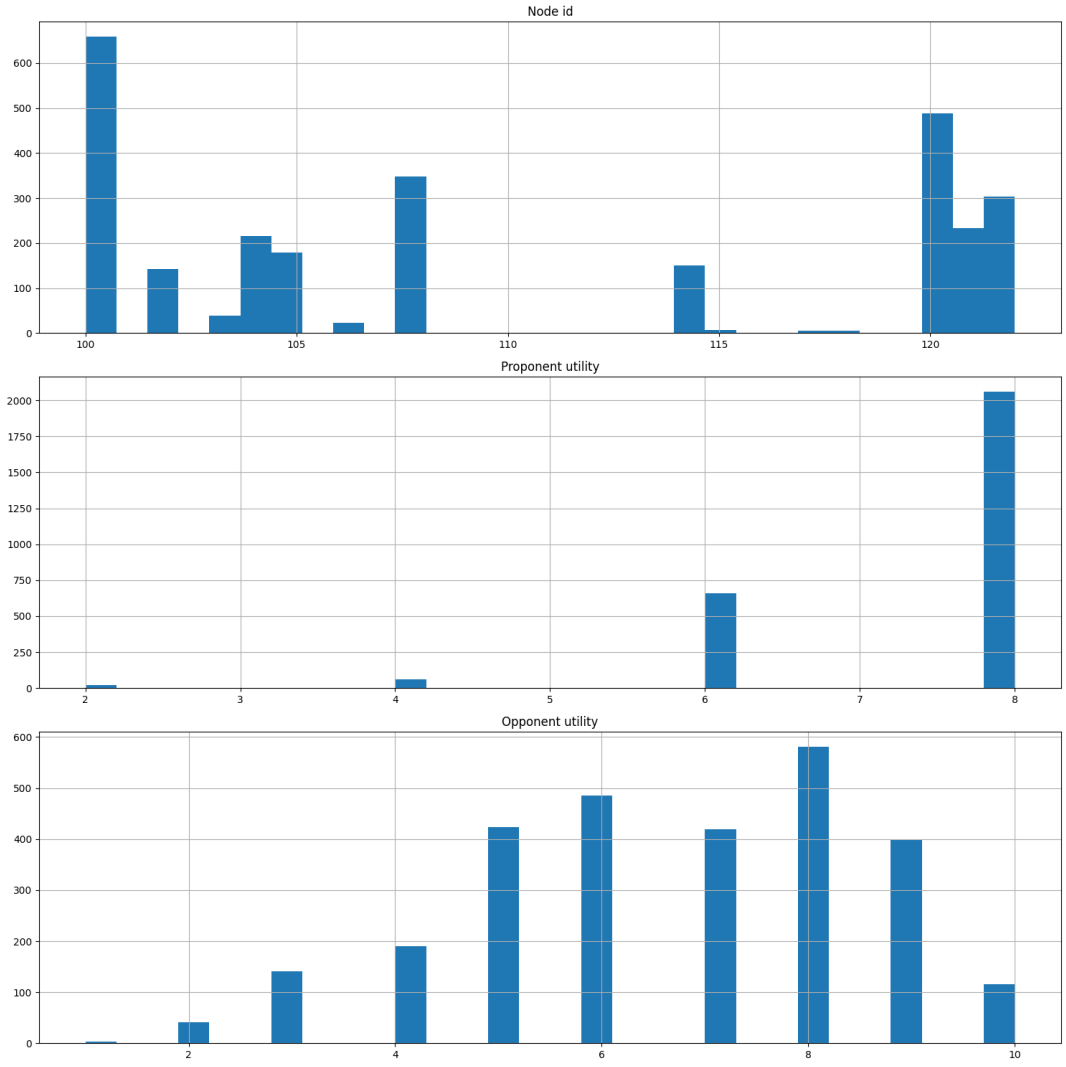

Figure 4: Histograms of the true nodes, and of the utilities, returned by the SimDialogue procedure.