IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

ELU 616: Artificial Intelligence Challenge Presentation

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SUMMARY

Q-learning approach

Supervised Learning approach

The “Quintarias” AI

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Q-learning approach

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Q learning approach

In lab session 6, we approximated the Q function using linear regression.

Now we propose a non linear approximation using a three-layer neural network.

NN hyperparameters

Keras

- Three dense layers (40,20 and 4) units each.
- **Input:** player-centered map reconverted to vector -> that makes 48 504 trainable parameters !
- **Activation functions:** Relu and linear in the last layer -> It’s not possible to use a Softmax layer as it’s a regression problem and not a classification one.
- **Optimizer:** Adam
- l**oss function:** mean squared error

Why Adam? How does it work?

- “Adaptative moment estimation”
- Presented in 2015
- Uses per-parameter learning rates that are adapted based on the estimation of the first two moments of the gradient (mean and non-centered variance)
- Well suited when there are lots of parameters to adjust
- Empirically, we obtained it was the only optimizer that produced good results

Performances

However… this method only won 38% of the games.

- 3.18 it/s in training
- Results in the last epoch w/d/l 32/5/63
- *Tensorflow backend*: game time and computational resources

Supervised Learning approach

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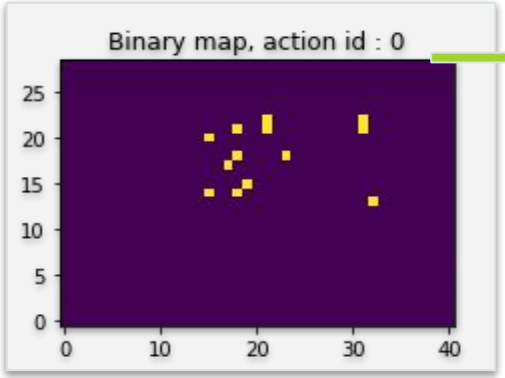
How can the player decide?

Dataset description

At the beginning, we generate 1000 games
> 50000 actions

Binary map centered in the player:
1 → it was a cheese

Input
dim: (1, 41 x 29) = (1, 1189)



Target
0,1,2,3
Action made

Does it describe the current state? is it enough?

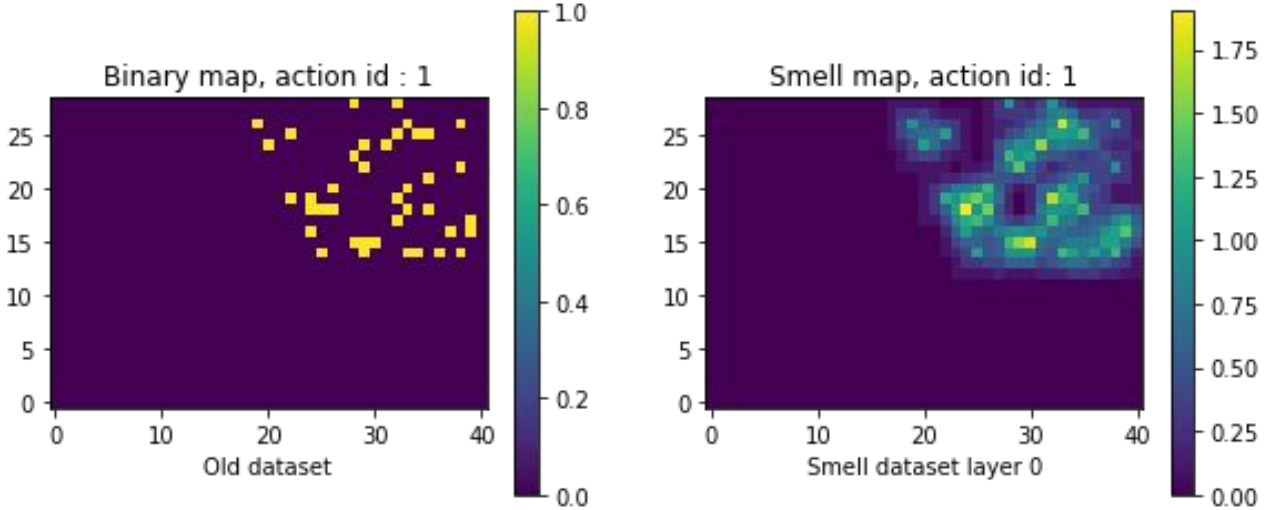
Supervised learning

We propose a supervised model that incorporates the notion of smell …

- The cheese's smell
- The opponent's smell

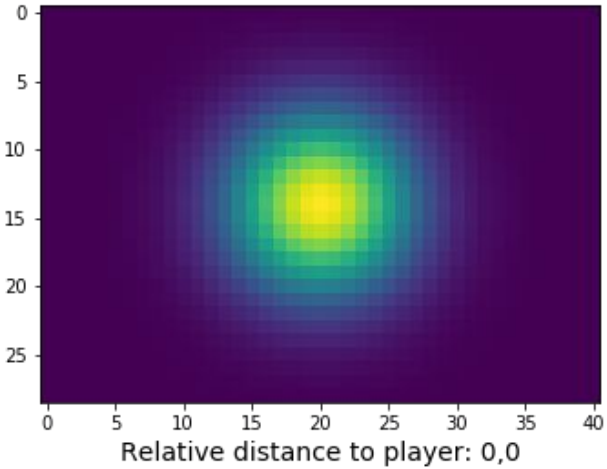
Cheese’s smell

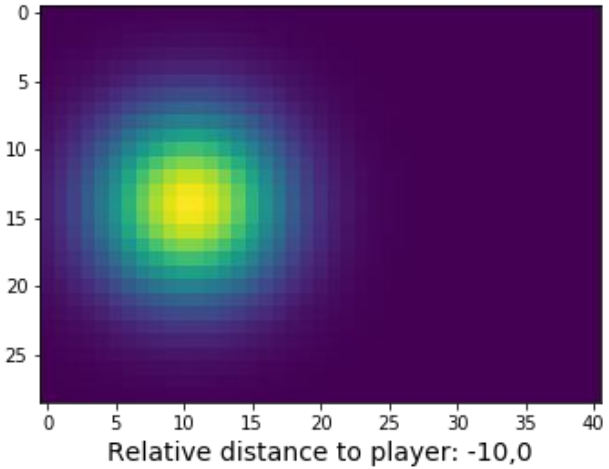
The cheeses are no more represented as binary locations in the map… we also represent the pixels near to cheese locations as having some positive values.



Opponent’s smell

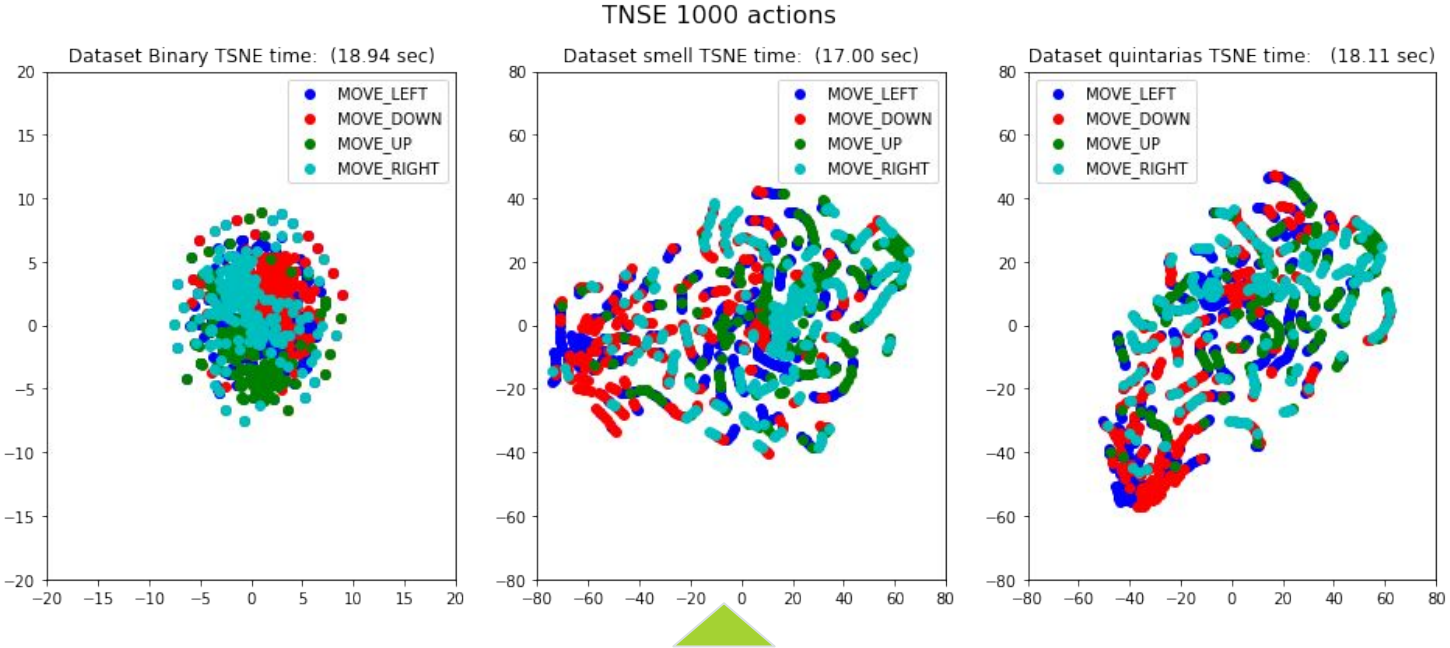
We also include the opponent’s position and smell by defining a 2D gaussian function centered in the player’s position.





How do datasets look like?

Visualization of 1000 actions



With our approach, samples corresponding to different actions become more different

With this new approach, the player might:

- Be more attracted by cheeses that are close to each other (the smell of different cheeses adds up).
- Try to “steal” cheeses from the opponent, as now he knows its position.

Quintarias : Cheese’s smell + Opponent’s smell

The “Quintarias” AI

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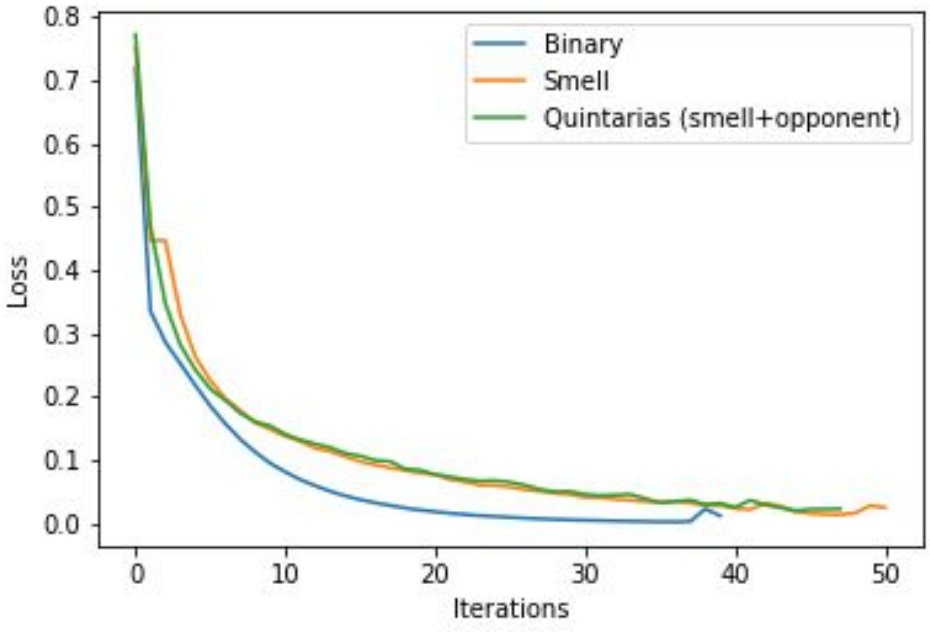
Multi-layer Perceptron classifier
scikit-learn

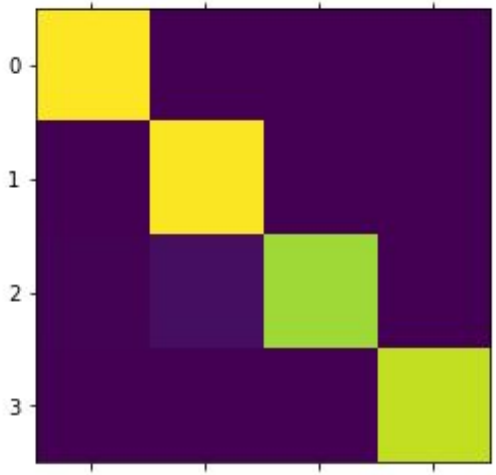
- Relu activation
- Adam optimizer
- Hidden layers by default (100,)
- logarithmic loss function

Training using split 0.8/0.2
3 datasets -- > 3 classifiers

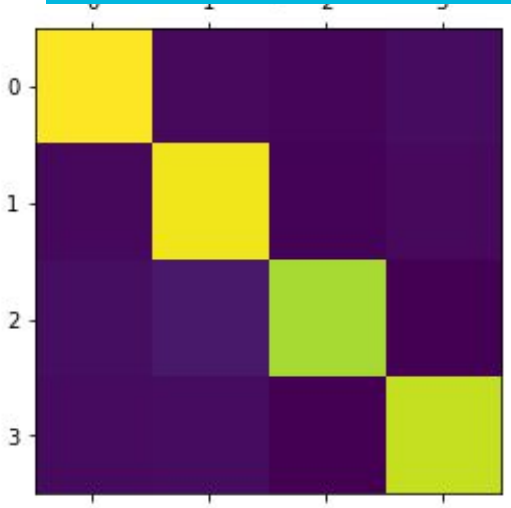


Confusion Matrices

Training Quintarias



Test Quintarias



Train Set:	precision	recall	f1-score	support
avg / total	0.99	0.99	0.99	47702
Test Set:	**precision**	**recall**	**f1-score**	
avg / total	0.92	0.92	0.92	11926

Is it really playing?

Playing

Will Quintarias destroy Manh?

```
--rat AIs/quintarias_sup.py --python AIs/manh.py
```

Classifier	Rat win / miss	Python win / miss
quintarias_sup	0.396 / 0.266	0.406 / 0.273
test_smell	0.372 / 0.172	0.353 / 0.19
test_bin	0.428 / 0.320	0.403 / 0.385

Thank you very much for your attention… any questions?

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