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CS:GO Player Recognition by RNN (LSTM)

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Research Introduction

Use the CS:GO in-game playing data to observe that if behaviour patterns exist in players' actions or not?

If we are able to use LSTM to recognize a specific player, then it could exist.

The Overview of the Research

Demo Files

- C#
- Demo Parser tool

Movement

Fired (e.g. knife, gun, grenade, etc.)

Hurt (Victim)

Grenade landing

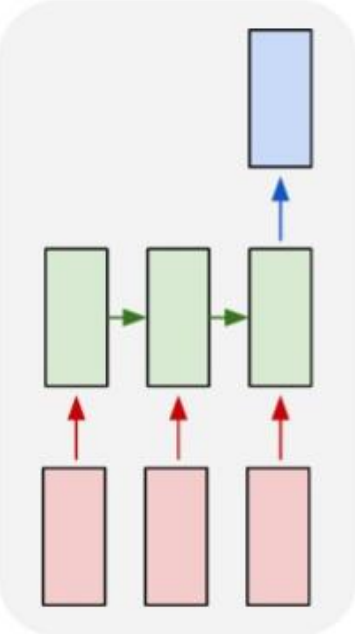
- Python

Player 1

Player 2

Player 5

- Python
- TensorFlow



Recurrent Neural Network (LSTM)

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Data Preprocessing Stage (cont.)

Demo Files

Movement

Fired
(e.g. knife, gun, grenade, etc.)

Hurt (Victim)

Grenade landing

Fact

- One match usually need to play in 2 or 3 maps.
- Each map need to play 30 rounds. A round usually has 2 minutes
- 1 second has 128 ticks.
- Therefore only a play in a map with 10 players will generate over 1 million records in the Movement file.

Challenges

- **How to deal with this huge data?**
- **How to combine Movement and other files?**

Data Preprocessing Stage (cont.)

CurrentTick	CurrentRound	Map	SteamID	Name	Team	PositionX	PositionY	PositionZ
18	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
50	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
82	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
114	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
146	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
178	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
210	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
242	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
274	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
306	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806

Movement

VelocityX	VelocityY	VelocityZ	ViewDirectionX	ViewDirectionY	ActiveWeapon	ActionType	Hitgroup	HitPositionX	HitPositionY	HitPositionZ
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	53.14636	358.0444	9	0	0	0	0	0
0	0	0	82.88635	2.504883	9	0	0	0	0	0
0	0	0	83.37524	2.158813	9	0	0	0	0	0
0	0	0	83.43567	2.043457	405	0	0	0	0	0
0	0	0	83.46313	1.988525	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0

Data Preprocessing Stage (cont.)

CurrentTick	CurrentRound	Map	SteamID	Name	Team	PositionX	PositionY	PositionZ
18	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
50	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
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178	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
210	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
242	1	de_train	76561198041683300	NiKo				-318.806
274	1	de_train	76561198041683300	NiKo				-318.806
306	1	de_train	76561198041683300	NiKo				-318.806

Fired

Update Movement File:
***. Action Type = 1**

VelocityX	VelocityY	VelocityZ	ViewDirectionX	ViewDirectionY	ActiveWeapo	ActionType	Hitgroup	HitPositionX	HitPositionY	HitPositionZ
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	53.14636	358.0444	9	0	0	0	0	0
0	0	0	82.88635	2.504883	9	0	0	0	0	0
0	0	0	83.37524	2.158813	9	0	0	0	0	0
0	0	0	83.43567	2.043457	405	0	0	0	0	0
0	0	0	83.46313	1.988525	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0

Data Preprocessing Stage (cont.)

CurrentTick	CurrentRound	Map	SteamID	Name	Team	PositionX	PositionY	PositionZ
18	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
50	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
82	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
114	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
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178	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
210	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
242	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
274	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
306	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806

Update Movement File:
***. Action Type = 2**
***. Hitgroup = Which part of body hit**
***. Position = Victim's position**

Hurt

VelocityX	VelocityY	VelocityZ	ViewDirectionX	ViewDirectionY	ActiveWeapon	ActionType	Hitgroup	HitPositionX	HitPositionY	HitPositionZ
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	53.14636	358.0444	9	0	0	0	0	0
0	0	0	82.88635	2.504883	9	0	0	0	0	0
0	0	0	83.37524	2.158813	9	0	0	0	0	0
0	0	0	83.43567	2.043457	405	0	0	0	0	0
0	0	0	83.46313	1.988525	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0

Data Preprocessing Stage (cont.)

CurrentTick	CurrentRound	Map	SteamID	Name	Team	PositionX	PositionY	PositionZ
18	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
50	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
82	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
114	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
146	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
178	1	de_train	765611980416					06
210	1	de_train	765611980416					06
242	1	de_train	765611980416					06
274	1	de_train	765611980416					06
306	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806

Update Movement File:
***. Action Type = 3**
***. Position = Grenade landing position**

Grenade landing

VelocityX	VelocityY	VelocityZ	ViewDirectionX	ViewDirectionY	ActiveWeapor	ActionType	Hitgrou	HitPositionX	HitPositionY	HitPositionZ
0	0	0	55.99731	0	9	0		0	0	0
0	0	0	55.99731	0	9	0		0	0	0
0	0	0	53.14636	358.0444	9	0		0	0	0
0	0	0	82.88635	2.504883	9	0		0	0	0
0	0	0	83.37524	2.158813	9	0		0	0	0
0	0	0	83.43567	2.043457	405	0		0	0	0
0	0	0	83.46313	1.988525	9	0		0	0	0
0	0	0	83.69385	2.098389	9	0		0	0	0
0	0	0	83.69385	2.098389	9	0		0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0

Data Preprocessing Stage (cont.)

CurrentTick	CurrentRound	Map	SteamID	Name	Team	PositionX	PositionY	PositionZ
18	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
50	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
82	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806
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306	1	de_train	76561198041683300	NiKo	3	1628	-1532	-318.806

VelocityX	VelocityY	VelocityZ	ViewDirectionX	ViewDirectionY	ActiveWeapon	ActionType	Hitgroup	HitPositionX	HitPositionY	HitPositionZ
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	55.99731	0	9	0	0	0	0	0
0	0	0	53.14636	358.0444	9	0	0	0	0	0
0	0	0	82.88635	2.504883	9	0	0	0	0	0
0	0	0	83.37524	2.158813	9	0	0	0	0	0
0	0	0	83.43567	2.043457	405	0	0	0	0	0
0	0	0	83.46313	1.988525	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0
0	0	0	83.69385	2.098389	9	0	0	0	0	0

Decrease the sample size from 128 ticks a second down to 4 tick a second

200 MB a map match become 10 MB

Player 1

Player 2

Player 5

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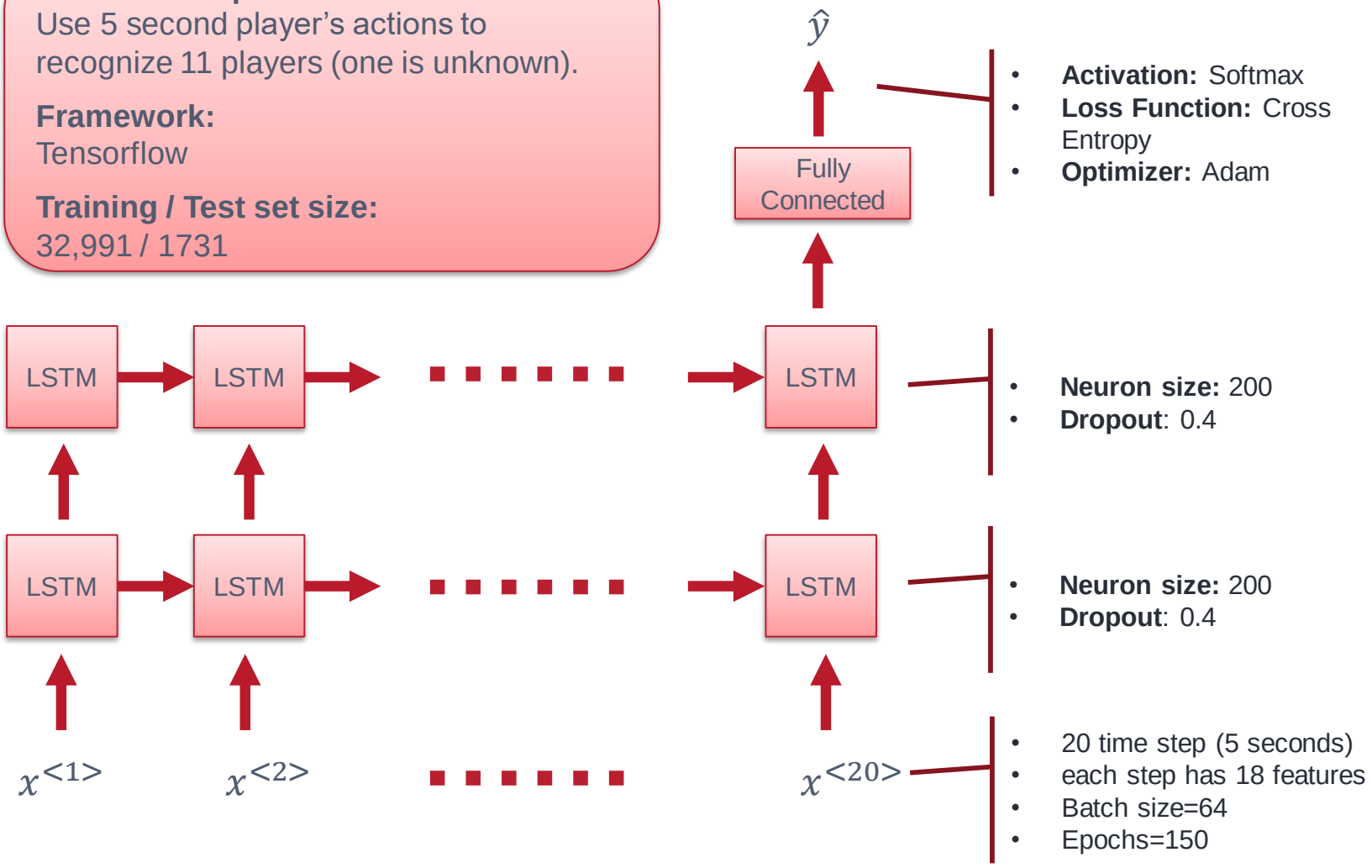
Player Recognition Model with RNN (LSTM)

Model Concept:
Use 5 second player's actions to recognize 11 players (one is unknown).

Framework:
Tensorflow

Training / Test set size:
32,991 / 1731



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Final Result (cont.)

Training Set Accuracy: 0.85

Test Set Accuracy: 0.83

Really Impressive Result!
It suggests that the behaviour patterns could exist in the player's actions

What's the next?

- Train the model longer
- The approach of sampling could be improved.
- The hyper-parameters and structure of the model could be tuned further.
- Increase the size of the dataset.
- Bring in more useful features and removes some useless features

Potential Business Benefits

- Improving the accuracy of current model could bring potential benefits as follows:
  - Detect the cheating players who use the Bot.
  - Detect the players who did not play at his normal level (match fixing).
- Extend the model to classify the level of the players (Excellent, Professional, Amateur, Normal, etc.). It could bring potential benefits as follows:
  - Seek potential talent players from normal players or low-level tournaments.
  - Improve the quality of matchmaking.