Automatic Discovery of Tactics in Spatio-Temporal Soccer Match Data

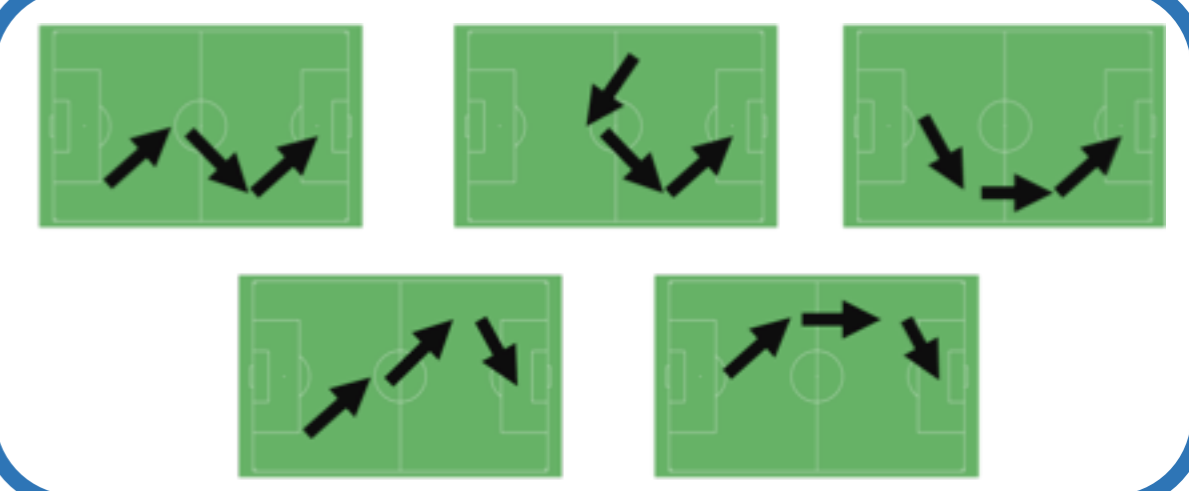Tom Decroos, Jan Van Haaren, Jesse Davis

DTAI — KU LEUVEN — SCISPORTS

Current state of the world

Analysts at soccer clubs spend many hours manually reviewing match footage to detect tactics, which is inefficient and error-prone.

What we aim to accomplish

Computer, give me the top 5 tactics of Manchester City

Data

A soccer match is described by +-1750 on-the-ball events.

Tackle ···▶ Pass ···▶ Pass ·▶ Shot ···▶

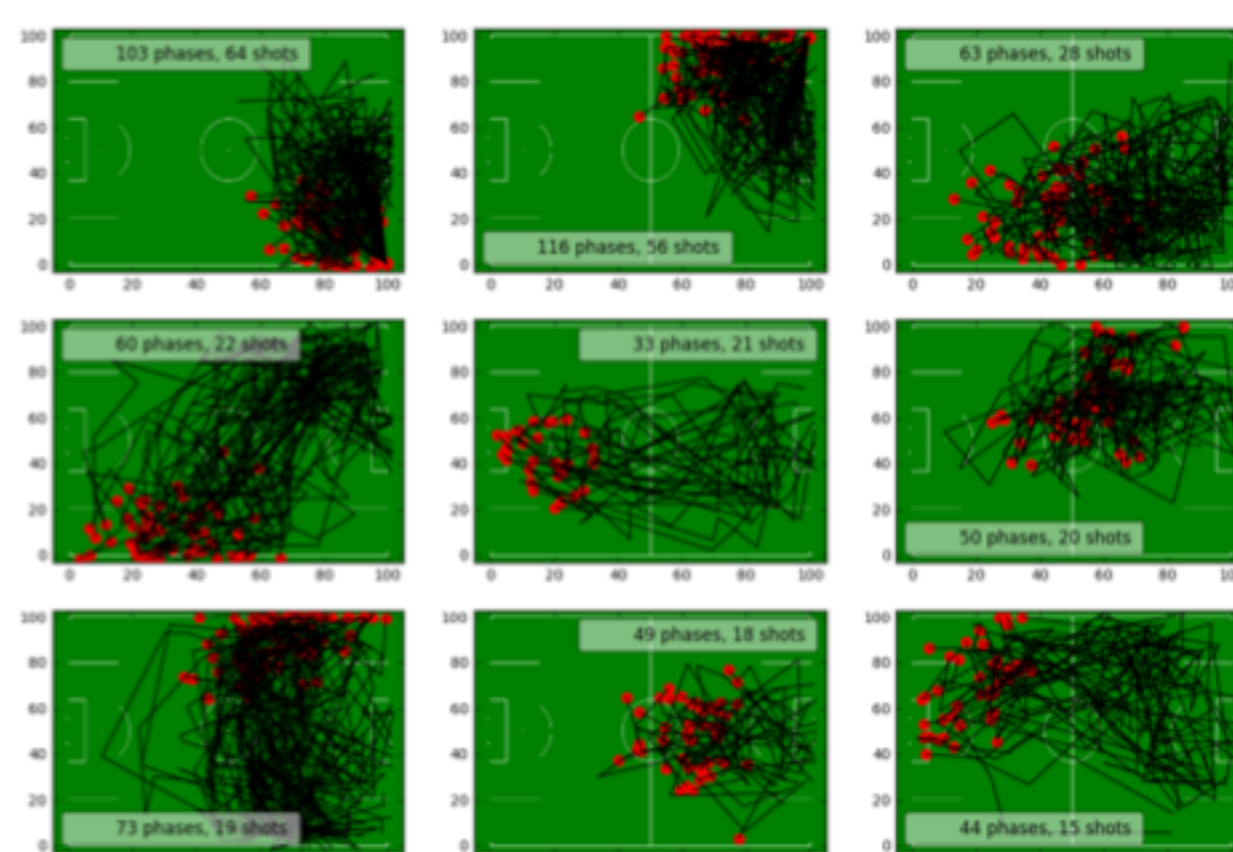| Pass	
Time:	12min 36sec
Location:	(32.2, 85.1)
Player:	Neil Taylor
Team:	Swansea

Challenges

1. Tactics involve space and time
2. Events have discrete and continuous attributes
3. How to exploit domain knowledge?
4. Relevance of tactics is subjective
5. Events have no universal definition

Approach

1 Divide the event stream of each match into phases

Phase i
Phase i + 1
Phase i + 2
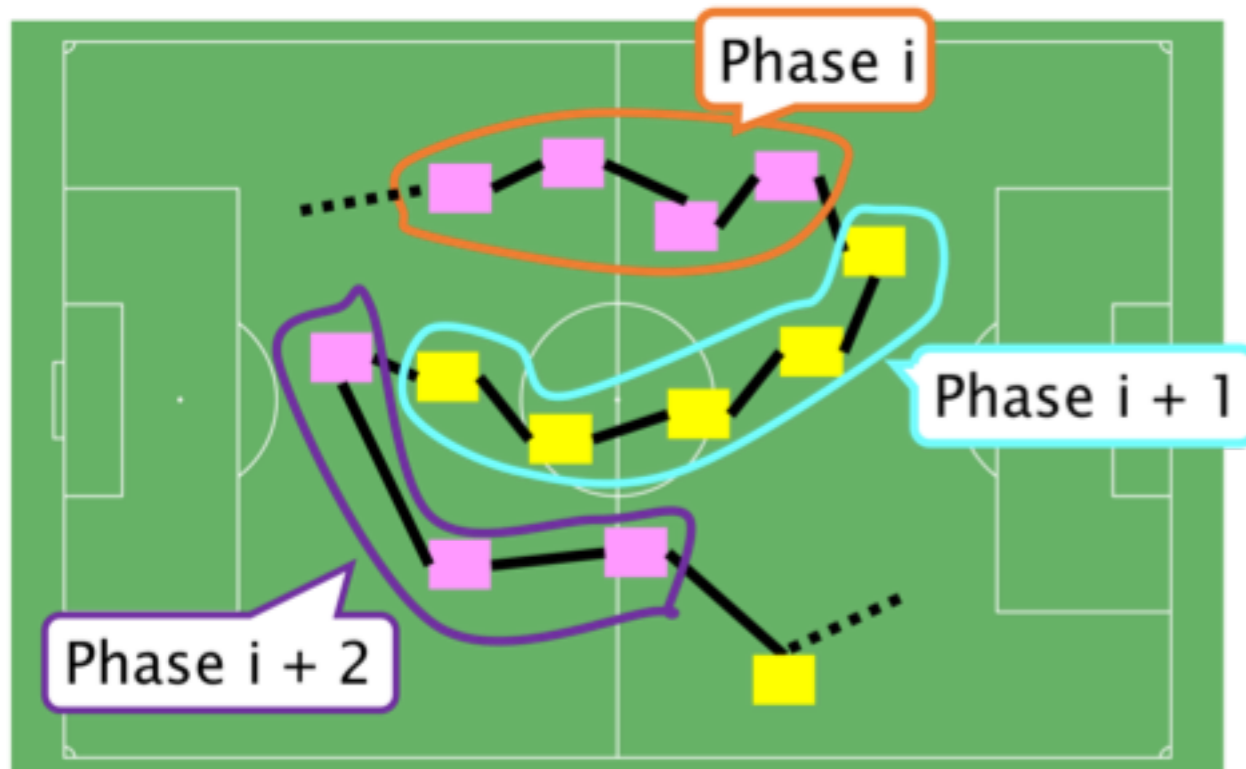
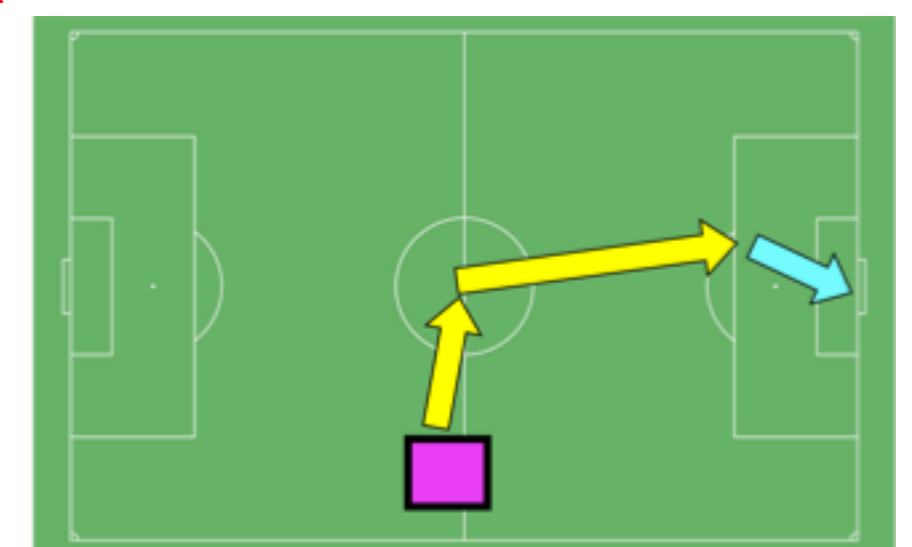**2** Cluster all phases on their spatio-temporal component using Dynamic Time Warping

3 Mine each cluster for frequent sequential patterns

Ball recovery AT the right flank
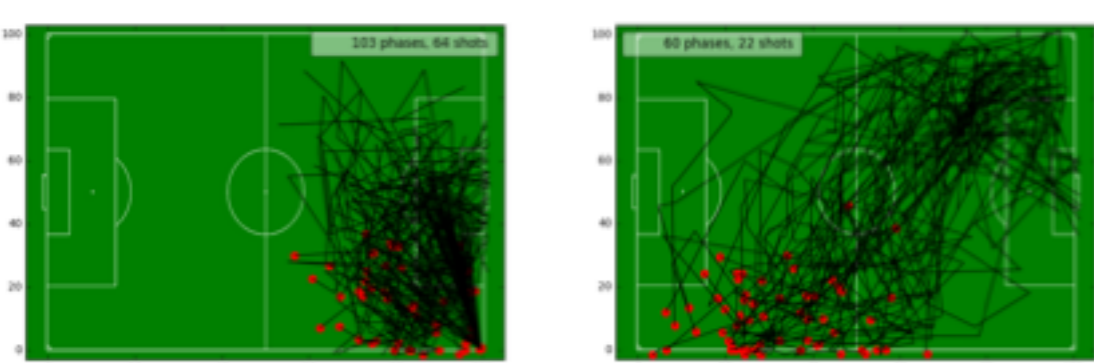⇒A pass FROM the right flank TO the midfield
⇒A long ball FROM the midfield TO the box
⇒Shot AT the box

Results

Q1: Do we discover interesting and relevant patterns?

1st and 4th ranked cluster of Manchester city in 2015/2016

Q2: Can we identify team tactics?

Cluster	Sequential Pattern
2nd Cluster	1. A pass OR cross FROM the left flank TO the box
	2. Shot
3rd Cluster	1. A pass FROM the midfield TO the midfield
	2. A pass FROM the midfield TO the midfield
	3. A pass FROM the midfield TO the midfield
9th Cluster	1. A pass FROM the midfield TO the midfield
	2. A pass FROM the midfield TO the left-flank
	3. A pass FROM the left flank TO the midfield
	4. A pass FROM the midfield TO the midfield
	5. A pass FROM the midfield TO the midfield

Cluster	Sequential Pattern
1st Cluster	1. A pass OR cross FROM the left flank TO the box
	2. A shot
2nd Cluster	1. A pass OR cross FROM the right flank TO the box
	2. A shot and a Miss
	3. Ball goes out of bounds
7th Cluster	1. A ball recovery IN the midfield
	2. A shot

Arsenal => midfield passing
Leicester City => counter-attack

Conclusion

Have we made the job of analysts any easier?

Not yet, but it's a good start.