

Clustering leisure POIs to create leisure hubs for a UK city

Patrick Ballantyne

Geographic Data Science Lab, University of Liverpool¹



Background

Why study leisure?

The sector has an annual turnover of **£117 billion** (Deloitte, 2016)

Improves **happiness and wellbeing** (Jing et al., 2018), and **quality of life** (Liu et al., 2017)

Geography of leisure hubs?

Limited, much more emphasis on geography of **retail** centres (Pavlis et al., 2016; Liu et al., 2017)

Project Objectives

- ★ Extract a **database** of **Leisure POIs**
- ★ **Cluster** Leisure POIs into Leisure Hubs
- ★ Create a Leisure Hub **hierarchy**

Data

- Geolytix Pubs & Restaurants
- Other Geolytix Shapefiles

Methods

Pre-processing of data and extraction of Leisure POIs

Clustering of POIs: DBSCAN ($\epsilon = 0.001$, MinPts = 3)

Construction of Hubs: Concave Hulls

Scoring of Hubs $Aw = n * W$
 $Lw = \sum Aw_i$

Table 1. Leisure POI weights

Amenity Type	Importance	Weight
Large Cinema Complex	Very High	0.85
Casino	Very High	0.85
Active Indoor Amenity	High	0.6
Nightclub/Discoteque/Ballroom	High	0.6
Venue Pubs	High	0.6
Music Venues	High	0.6
Stadium	High	0.6
Bingo Hall	Mid	0.5
Pubs with Food	Mid	0.5
Health Centre	Mid	0.5
Small Cinema	Mid-Low	0.3
Restaurant	Mid-Low	0.3
Community Pubs	Low	0.1

Results

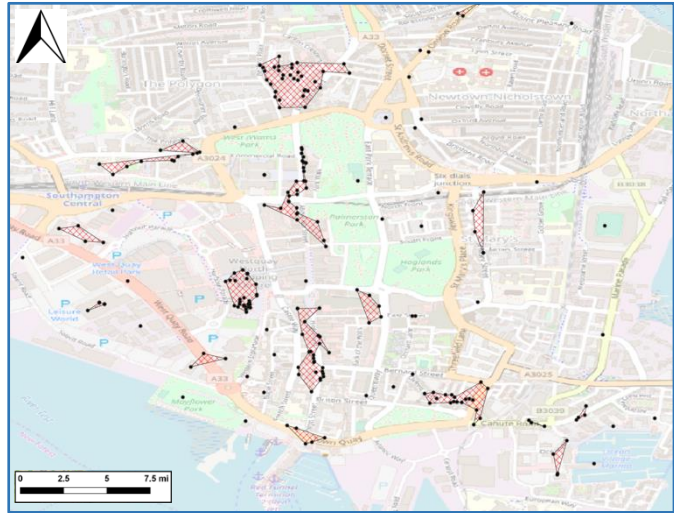


Figure 1. Distribution of Leisure across Southampton

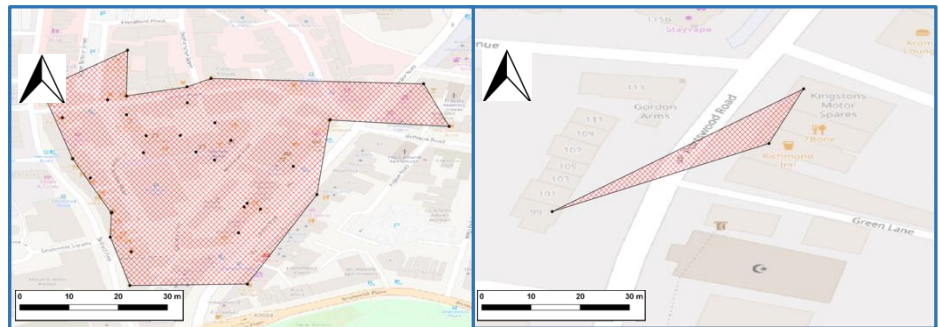


Figure 2. Highest scoring leisure hub

Figure 3. Lowest scoring leisure hub

Table 2. Features of high and low scoring leisure hubs

Hub Rank	Hub Score	Hub Name	Features	Example Fascia
1	14.8	The Polygon	13 Restaurants, 1 Health Centre, 3 Nightclubs, 2 Pubs, 10 Venue Pubs, 6 Pubs with Food	Revolution, PopWorld, La Qila
2	12.4	The Spitfire	15 Restaurants, 2 Active Indoor Amenities, 1 Nightclub, 5 Pubs with Food, 5 Venue Pubs	Neighbourhood, Nandos, Switch
3	12.2	Winchester High Street	14 Restaurants, 2 Pubs, 3 Pubs with Food, 8 Venue Pubs	Kyoto, ASK Italian, Turtle Bay
50	0.7	Shirley	1 Health Centre, 2 Pubs	Overdraft Alehouse, Brass Monkey
51	0.5	Botley Rd/Fairoak Rd.	2 Pubs, 1 Restaurant	The Old George, Fairoak Curry House
52	0.5	Portsmouth Rd/Gordon Av.	2 Pubs, 1 Restaurant	Richmond Inn, Gordon Arms

Reflections

- ✓ DBSCAN and concave hulls captured the spatiality of POI clustering, and the distribution of leisure across Southampton.
- ✓ Classification of hubs was robust given the key differences between high and low scoring hubs.



Use of global epsilon value restricts applicability beyond Southampton... modified DBSCAN method with varying ϵ values would be more suitable, as in Pavlis et al. (2018).

References

- Deloitte (2016). *Passion for Leisure: A view of the UK Leisure Consumer*.
- Jing, Y., Liu, Y., Cai, E., Yi, L. and Zhang, Y., 2018. Quantifying the spatiality of urban leisure venues in Wuhan, Central China – GI-based spatial pattern metrics. *Sustainable cities and society*, 40.
- Liu, Y., Jing, Y., Cai, E., Cui, J., Zhang, Y. and Chen, Y., 2017. How Leisure Venues Are and Why? A Geospatial Perspective in Wuhan, Central China. *Sustainability*, 9(10), p.1865.
- Pavlis, M., Dolega, L. and Singleton, A., 2018. A Modified DBSCAN Clustering Method to Estimate Retail Centre Extent. *Geographical Analysis*, 50(2), pp.141-161.