Digital Media Social Networks ECS637U
TOPIC 5: Analysing the Amazon Product Co-purchasing Network

UG_35:
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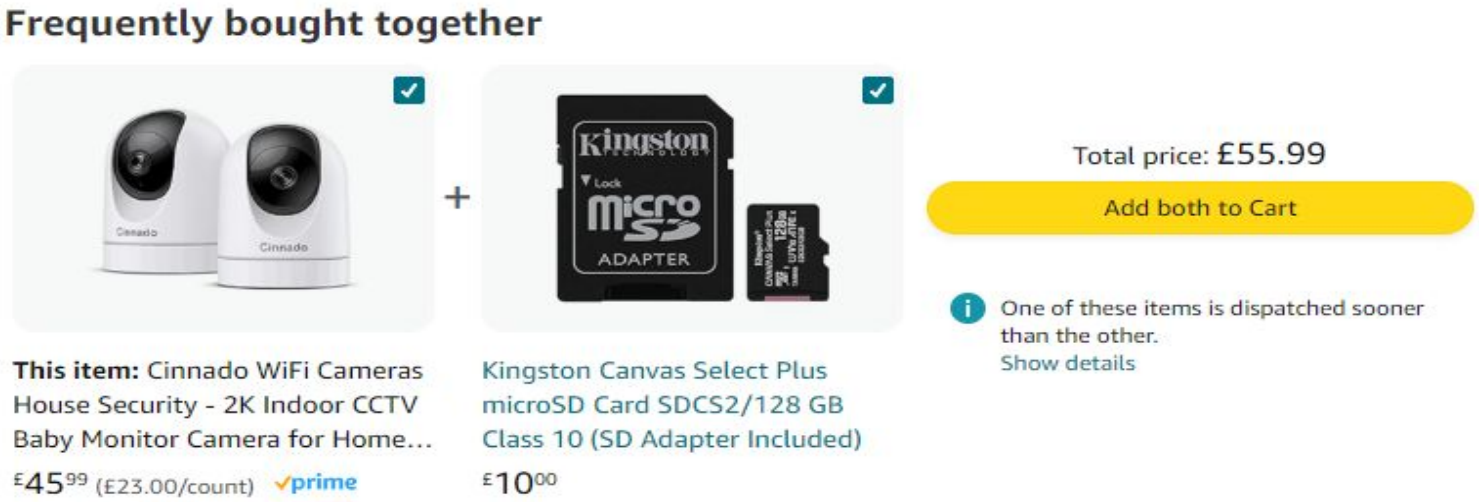
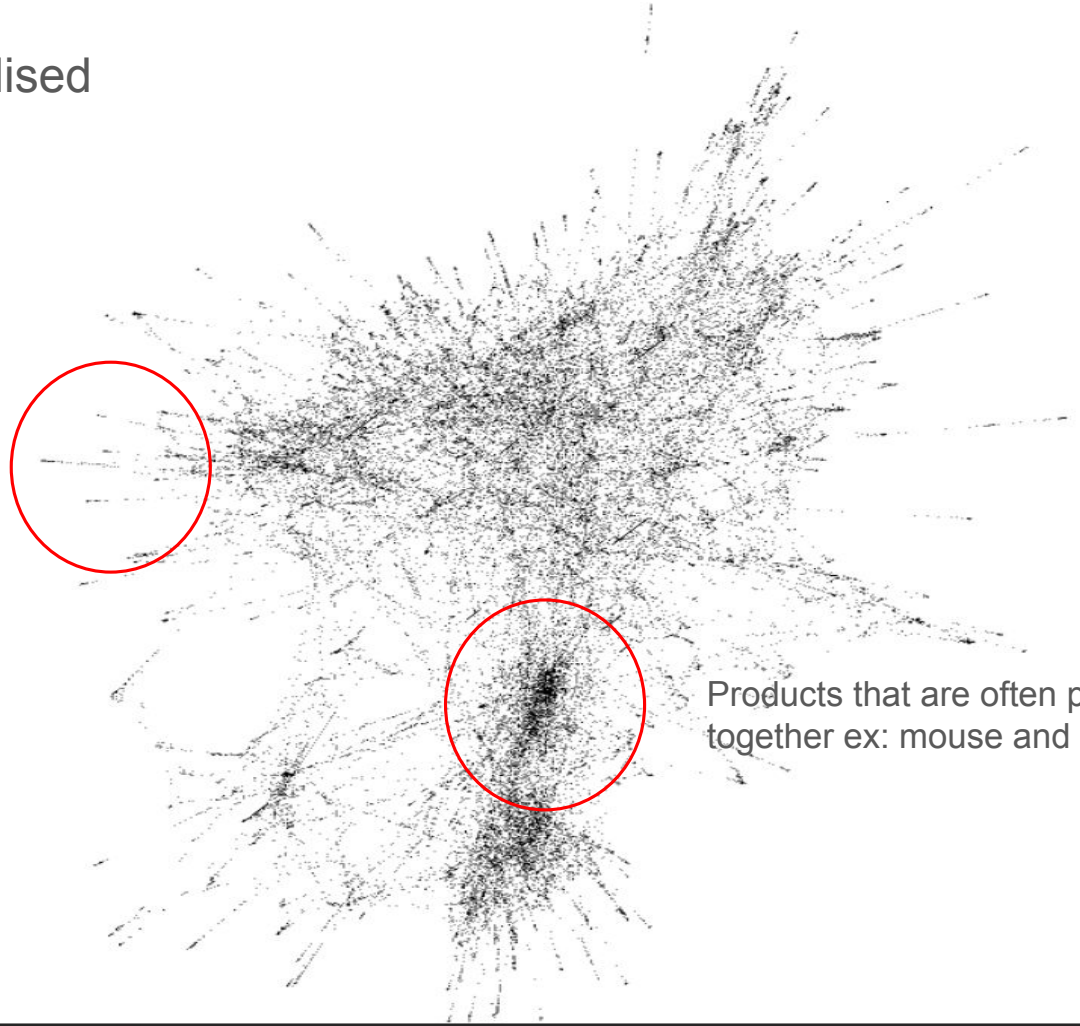
What is co-purchasing?

- In this context it is the act of buying multiple items off of amazon at the same time
- Often times people will purchase multiple items together such as a camera and and sd card to store the cameras video on
- “Predicting co-purchasing products based on previous order history of users can help online shopping websites to recommend proper products to users” **[3]**



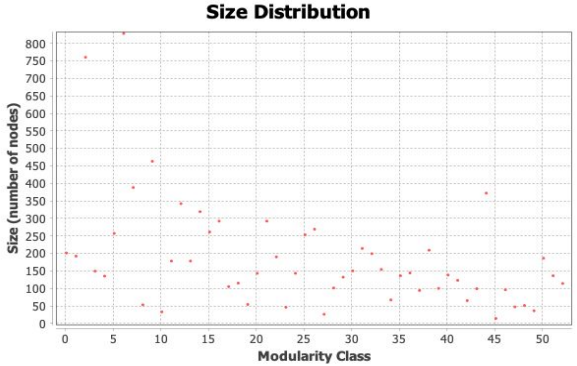
The Data Visualised



Products that more rarely are purchased together

Products that are often purchased together ex: mouse and keyboard

Basic Network Statistics

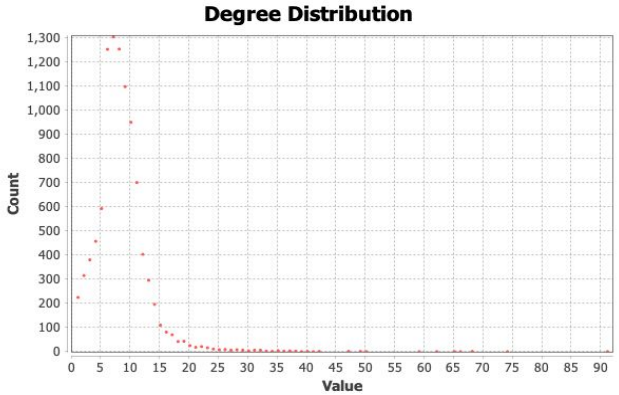


Modularity (0.885):

Defined as the strength of division of a network into modules [1]

Density (0.00041758824):

Represents the proportion of potential connections that are actual connections [2]



Average Degree (4.176):

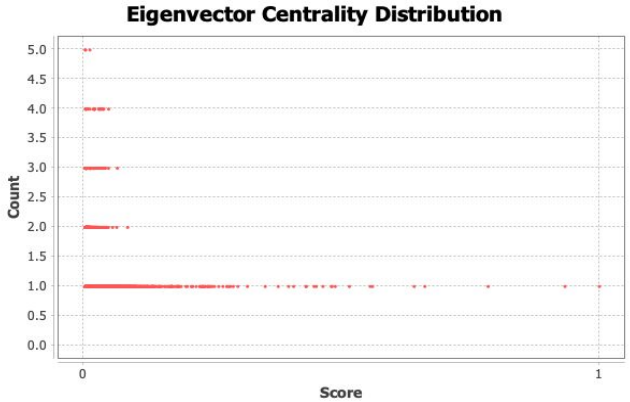
This metric quantifies the typical number of connections each node has within the network, reflecting its overall connectivity [2]

Implications:

Evaluates effectiveness of recommendations

High-degree - important in cross-selling strategies and can inform targeted recommendations.

Low-degree - maintains diversity and caters to specific demands.



Network Interpretation: Directed: The analysis considers the direction of co-purchase, from product i to product j.

Iterations: 100 iterations were used to ensure the convergence and accuracy of the eigenvector centrality scores.

Sum Change: The sum change of 0.5566 indicates that the scores have reached a stable state by the last iteration, confirming the accuracy of the results.

Network Analysis

Objective: To conduct an analysis of the Amazon co-purchasing network's structural properties, aiming to reveal their impact on the efficiency and accuracy of the recommender system.

Methodology:

1. **Small-World Network Analysis**: Use networkX to assess small-world characteristics by comparing average path lengths and clustering coefficients, enhancing navigability and community insight.
2. **PageRank Implementation**: Use networkX to Quantify the structural importance of individual products by ranking them using the PageRank algorithm, identifying the top five influential products to improve cross-selling and user experience (UX).
3. **Community Detection**: Use Gephi to apply algorithms to detect and visualise product clusters in the co-purchasing network, analyzing the largest communities to gain insights into consumer preferences and inform targeted marketing and product strategies.

References

[1]
V. D. Blondel, J.-L. Guillaume, R. Lambiotte, and E. Lefebvre, “Fast unfolding of communities in large networks,” *Journal of Statistical Mechanics: Theory and Experiment*, vol. 2008, no. 10, p. P10008, Oct. 2008, doi: https://doi.org/10.1088/1742-5468/2008/10/p10008.
[2]
M. Newman, “Networks,” Mar. 2010, doi: https://doi.org/10.1093/acprof:oso/9780199206650.001.0001.

[3]

Y. Liu, C. Wu, and X. Tong, “Prediction of Co-purchasing Products.” doi: https://cseweb.ucsd.edu/classes/sp15/cse190-c/reports/sp15/039.pdf