Introduction
Most navigation systems are programmed to promote the shortest distance between a start and an endpoint. Distance and time may be important to a pedestrian, but safety should be taken into consideration as well.

Isla Vista is a 1/4 square mile unincorporated community within Santa Barbara County. It is estimated that 8,000 pedestrians live and enter Isla Vista each day, making foot traffic safety of great importance (County of Santa Barbara, pp 2-32). Through a comprehensive raster map of street light illumination, crime location data, sidewalk availability, and location of intersections, we attempt to portray how safety-dependent navigation varies from classic shortest path navigation and how the shortest path may differ from the safest path.

Materials and methods
I. Collect in situ and internet data
II. Create the nodal network
III. Create light layer
IV. Create crime/injury interpolation
V. Create raster layers of sidewalk presence and intersection types
VI. Choose Point A and B for path used to represent how different safety factors influence route
VII. Compute variety of routes using Dijkstra’s algorithm

Results

Figure 1: The shortest path between the two points used for our project (Pardal Tunnel to Santa Catalina Dorms) - from Google maps.

Figure 2 (left): Final result of the adjacency algorithm of street lights and ambient light readings in Isla Vista is a nodal network shape file.

Figure 3 (right): Kriging street light map needed to be normalized and inverted so the Dijkstra’s algorithm could minimize a path of highest light.

Figure 4 (above): Results of path analysis for the light, crime/injury, and intersections layers individually.

Figure 5 (above): Results of all the light, crime/injury, intersection, and sidewalk layers combined. It should be noted that the path is the same as the shortest path (figure 1).

Figure 6 (above): The safest path from 6500 block Del Playa Rd. to Santa Catalina dorms. Changing the start point can greatly change the safest path (see figure 7).

Figure 7 (above): The shortest path from Santa Catalina Dorms from Google Maps. While this is the route navigation systems would suggest, it is not computed as the safest.

Conclusions
Our analysis shows that the shortest path is not necessarily the safest path. However, the similarity between the shortest path and the safest path suggests that city planners have successfully incorporated safety into the design of walking corridors through Isla Vista.

Future work for this project would be to create a web portal interface for users to select the starting and ending points, with the safety factors to be included. Such a tool could not only help the public choose paths through Isla Vista, but could also help city planners further develop safe infrastructure.

Lastly, additional layers could be added such as foot traffic, different lighting conditions such as fog, and more extensive crime and personal injury layers.

Literature cited

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Further information
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