Three-Dimensional Modelling of Hockey Event Frequencies
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Background / Rationale

- Current methods of visually representing the frequency of hockey-related random events are limited to tables, charts and 2D heat maps.
- Although useful, these tools lack the ability to capture shot locations and trends with visual ease and appeal.
- The **objective** of this study was to determine if 3D-printed models representing the frequency of hockey shots in specified coordinates on the ice surface could be used as effective tool of comparison.

Test Subjects

Figure 1: Alexander Ovechkin

Figure 2: Sidney Crosby

- Alexander Ovechkin and Sidney Crosby serve as ideal candidates for the comparison of shooting patterns using different methods, as their shooting tactics are distinct.

- Table 1 represents a quantitative comparison of their shooting behaviors, but can also be used to validate what 3D models will show.

- The peaks on the 3D models illustrate the areas where high volumes of hockey shots are taken by each player.

Table 1: Quantitative Shot Data

Metric	Crosby	Ovechkin
HDCF	585	477
HDCF/CF (%)	28%	13%
Average Shot Distance (feet)	25.46	33.84

HDCF: High Danger Corsi For
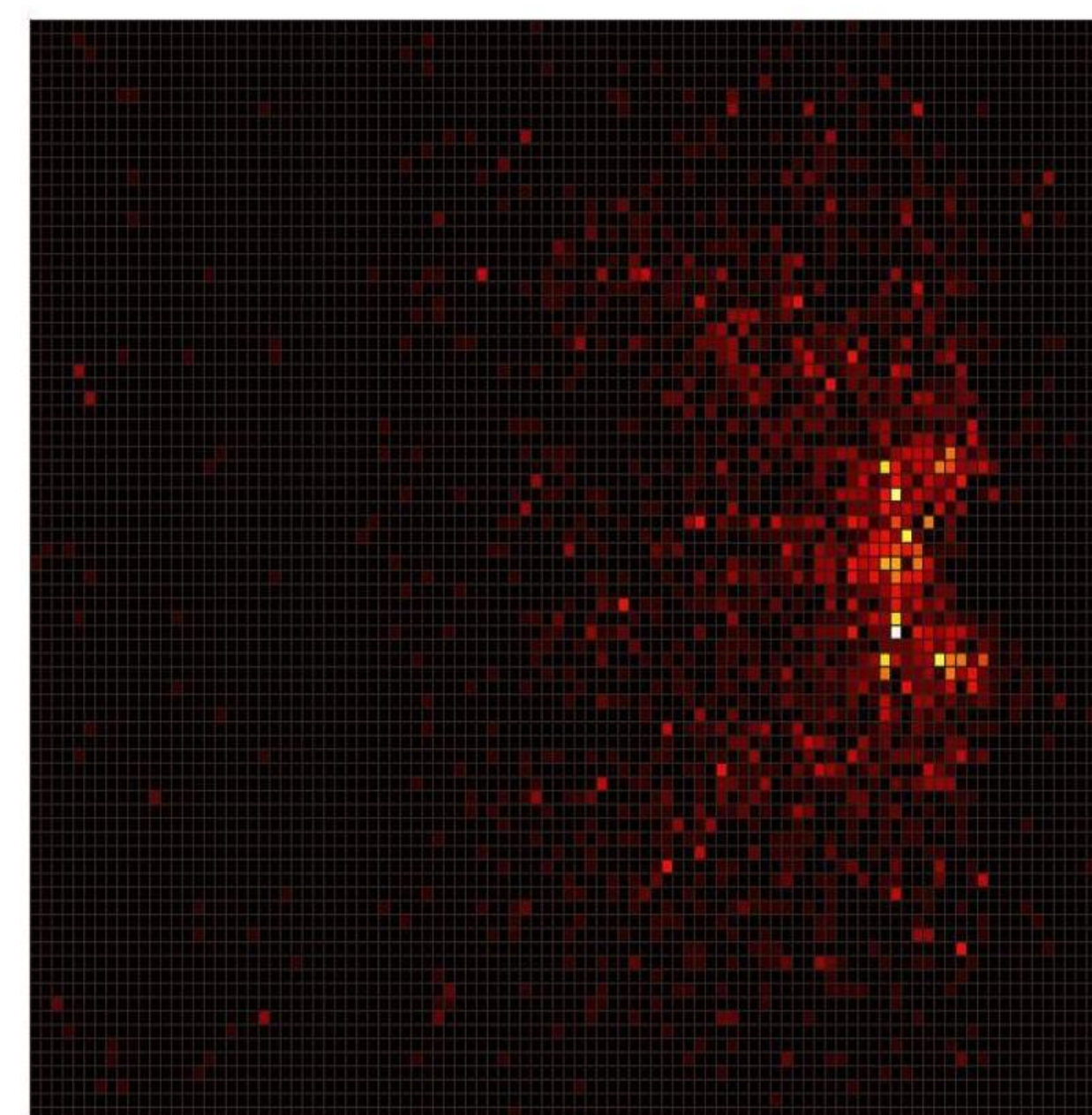CF: Corsi For

Current State

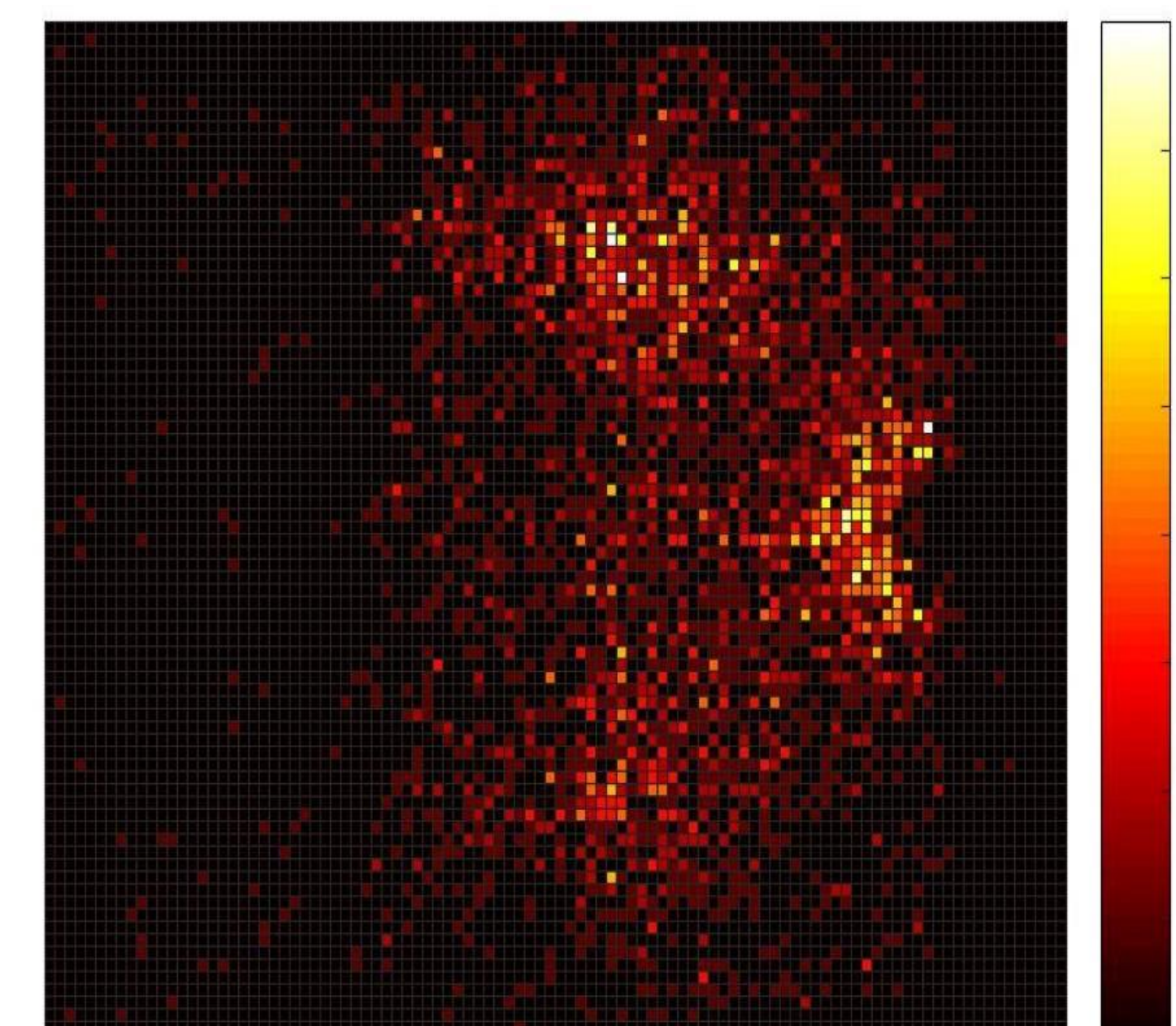Figure 3: Sidney Crosby's Shot Frequency Distribution

Figure 4: Alexander Ovechkin's Shot Frequency Distribution

Heat maps are used currently to illustrate the shooting locations of hockey players. While useful, heat maps can also be challenging for the novice eye to interpret, as subtle differences in color can be difficult to identify.

Methodology

Identify the Scope

- The **'total individual shots'** was the hockey related random event chosen to test.
- The time interval of the shot data includes all regular season games between 2010/2011 to 2016/2017.

Define the Parameters

- The offensive half of the ice was divided into a grid of equally sized squares with each square having a value equal to the number of shots taken within that area.
- A table was created with the same dimensions as the square grid.

Convert the Model

- The table was exported to MATLAB as an array of shot frequencies. It was then plotted as a surface plot and converted to a *.stl file for 3D printing.
- The frequency of hockey shots at specified locations was projected vertically with the height proportional to the number of shots.

Results

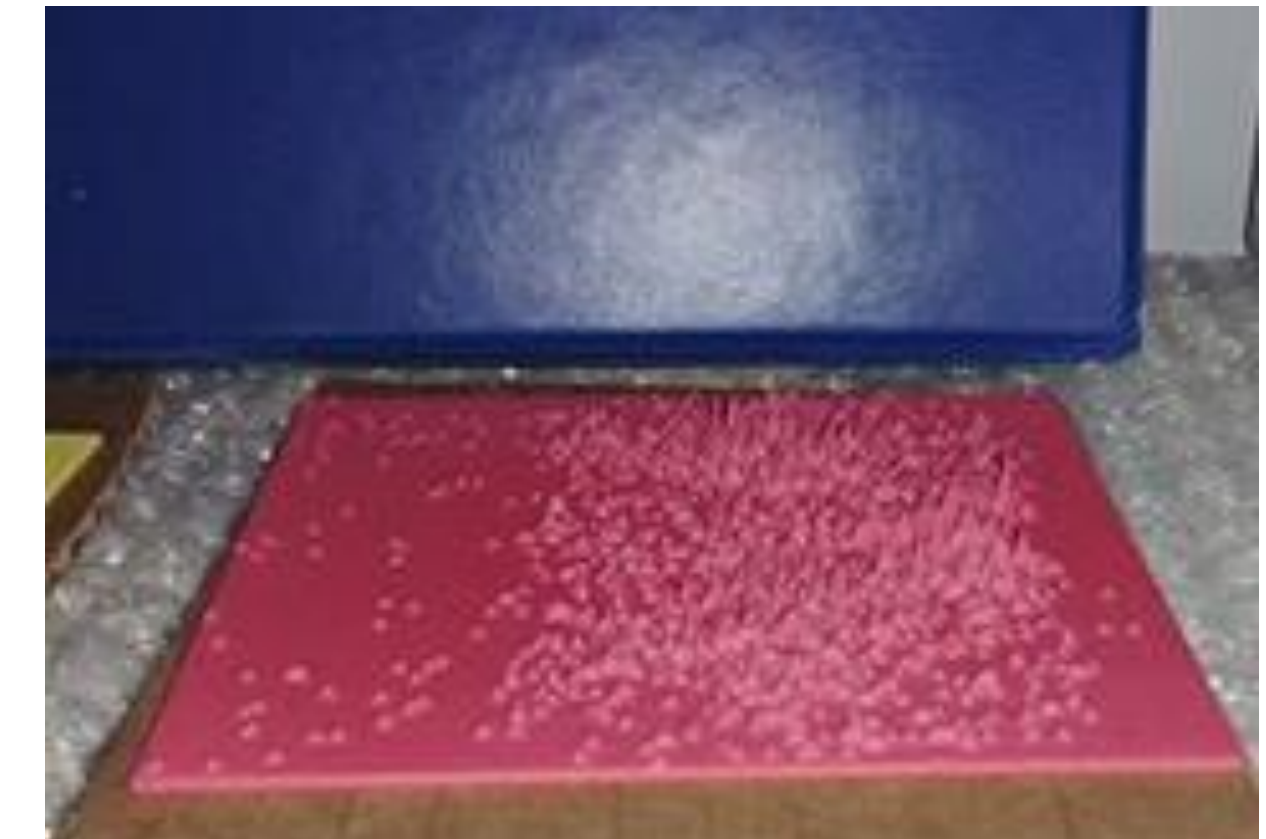Figure 5: Sidney Crosby's 3D Model Shot Distribution

Figure 6: Alexander Ovechkin's 3D Model Shot Distribution

3D Model
- Can be viewed from multiple vantage points
- 'Easy to identify' frequencies at specific coordinates
- Clearly highlights the magnitude of shots

Heat Maps
- Electronically friendly
- Easy to prototype
- Only requires computer and software to create

Both
- The subtleties of two similar players cannot be distinguished
- Stratifying the hockey shot data by type while maintaining an overall picture is difficult

Conclusion & Impact

- Creating an effective comparison of the shooting locations of two hockey players in three dimensions requires a large volume of data.
- Creating the 3D models requires an investment of time and financial recourses, as well as an aptitude for the use of technology.
- 3D models serve as an engaging medium of data visualization, but their use is limited to the comparison of one statistic at a time.

References
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