**Assignment 2: Centrality MetricsName: SURAJ NAKKA netID: surajnakka UID: U20904490**

**Problem 1: Correlation between Network Centrality Metrics**

1. Centrality Metrics Plots - US airports Dataset

|  |  |
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| **Degree Centrality** | **Closeness centrality** |
| **Harmonic closeness centrality** | **Betweenness centrality** |
|  | **Local clustering coefficient** |

1. **IMDB actors**

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| **Degree Centrality** | **Closeness centrality** |
| **S:\Desktop\GDP\Proj2\imdb_actor.elist.txt.harmonic.pngHarmonic closeness centrality** | S:\Desktop\GDP\Proj2\imdb_actor.elist.txt.betweenness.png**Betweenness centrality** |
|  | **Local clustering coefficient** |

1. **Steam-Sweden**

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| **Degree Centrality** | **S:\Desktop\GDP\Proj2\U70661293_Assignment2\USairport_2010.elist.txt.Closeness.pngCloseness centrality** |
| **S:\Desktop\GDP\Proj2\U70661293_Assignment2\USairport_2010.elist.txt.harmonic.pngHarmonic closeness centrality** | S:\Desktop\GDP\Proj2\U70661293_Assignment2\USairport_2010.elist.txt.betweenness.png**Betweenness centrality** |
|  | **Local clustering coefficient** |

1. **Top 10 centrality nodes** 
   1. **US airports**

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| --- | --- | --- | --- |
| **Degree centrality** | **Closeness centrality** | **Harmonic closeness centrality** | **Betweenness centrality** |
| **Atlanta, GA: Hartsfield-Jackson Atlanta International** | Millbrook, NY: Sky Acres | **Atlanta, GA: Hartsfield-Jackson Atlanta International** | Anchorage, AK: Ted Stevens Anchorage International |
| Washington, DC: Washington Dulles International | Laconia, NH: Laconia Municipal | Los Angeles, CA: Los Angeles International | Fairbanks, AK: Fairbanks International |
| Chicago, IL: Chicago O'Hare International | Atlanta, GA: Hartsfield-Jackson Atlanta International | Washington, DC: Washington Dulles International | Los Angeles, CA: Los Angeles International |
| Los Angeles, CA: Los Angeles International | Los Angeles, CA: Los Angeles International | Minneapolis, MN: Minneapolis-St Paul International | New York, NY: John F. Kennedy International |
| New York, NY: John F. Kennedy International | Minneapolis, MN: Minneapolis-St Paul International | New York, NY: John F. Kennedy International | Miami, FL: Miami International |
| Denver, CO: Denver International | Denver, CO: Denver International | Chicago, IL: Chicago O'Hare International | Seattle, WA: Seattle/Tacoma International |
| Newark, NJ: Newark Liberty International | Washington, DC: Washington Dulles International | Denver, CO: Denver International | White Plains, NY: Westchester County |
| Minneapolis, MN: Minneapolis-St Paul International | New York, NY: John F. Kennedy International | Newark, NJ: Newark Liberty International | Denver, CO: Denver International |
| Houston, TX: George Bush Intercontinental/Houston | Orlando, FL: Orlando International | Houston, TX: George Bush Intercontinental/Houston | **Atlanta, GA: Hartsfield-Jackson Atlanta International** |
| Miami, FL: Miami International | Chicago, IL: Chicago O'Hare International | Orlando, FL: Orlando International | Minneapolis, MN: Minneapolis-St Paul International |

* 1. **IMDB actors**

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| **Degree centrality** | **Closeness centrality** | **Harmonic closeness centrality** | **Betweenness centrality** |
| **Davis, Mark (V)** | Kuusniemi, Matti | Goldberg, Whoopi | Jeremy, Ron |
| Sanders, Alex (I) | L‰hde, Ville (I) | Hanks, Tom | Chan, Jackie (I) |
| North, Peter (I) | Pickhaver, Greig | Jackson, Samuel L. | Cruz, PenÈlope |
| Marcus, Mr. | Walsh, Darren (I) | Berry, Halle | Shahlavi, Darren |
| Tedeschi, Tony | Nawrocki, Mike | Diaz, Cameron | Del Rosario, Monsour |
| Dough, Jon | Vischer, Phil | Stiller, Ben | Depardieu, GÈrard |
| Stone, Lee (II) | Vischer, Lisa | Lopez, Jennifer (I) | Bachchan, Amitabh |
| Voyeur, Vince | Poole, Jim | Myers, Mike (I) | Jackson, Samuel L. |
| Lawrence, Joel (II) | Mizuki, Arisa | Douglas, Michael (I) | **Soualem, Zinedine** |
| Steele, Lexington | Zaki, Mona | Cruise, Tom | Del Rio, Olivia |

* 1. **Steam Sweden**

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|  | **Degree centrality** | **Closeness centrality** | **Harmonic closeness centrality** | **Betweenness centrality** |
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1. **Running Times on C4 lab machines**

**These are the approximate execution times.**

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|  | US airports | IMDB actors | Steam Sweden |
| **Degree centrality** | 0m6.346s | 0m9.414s | 0m24.632s |
| **Closeness centrality** | 0m10.715s | 4m49.882s |  |
| **Harmonic closeness centrality** | 0m17.594s | 25m34.125s |  |
| **Betweenness centrality** | 0m10.677s | 18m45.745s |  |
| **Local clustering co-efficient** | 0m4.304s | 0m5.880s | 0m24.044s |