DECISION SUPPORT SYSTEMS

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INTRODUCTION



OVERVIEW





INTRODUCTION TO DSS

- A decision support system (DSS) gives its users access to a variety of data sources, modeling techniques, and stored domain knowledge via an easy to use GUI.
- For example:
 - Using data residing in databases, cloud, data warehouses, data lakes
 - Preparing mathematical models, statistical moels using this data
 - Solving or analyzing these models using problem-specific methodologies
 - Assisting the user in the decision-making process through a graphical user interface
- Learning DSS development combines operation research and business skills with data science and machine learning skills
- This combination make students highly sought after in the modern workplace.



DEFINING A DSS

- "A decision support system (DSS) is a model-based or knowledge-based system intended to support managerial decision making in semi-structured or unstructured situations" (Turban and Aronson, 2001).
- A DSS is not meant to replace a decision maker, but to extend his/her decision making capabilities.
- Characteristics of a DSS include:
 - Combining human judgment with computerized information
 - Designed to be user-friendly
 - Uses models for analyzing decision-making situations
 - Improves the effectiveness of making a decision
 - Provides managerial support





DEFINING A DSS (CONT'D)

A DSS application contains five components:

Database : provides data

Model base : models used for simulation, optimization, calculation and analysis

Knowledge base :domain expertise

GUI : Graphical User Interface

User : Decision Maker



Journal Metrics

CiteScore: 4.65 (i)

More about CiteScore

Impact Factor: 3.565 🛈

5-Year Impact Factor: 4.574 ⁽¹⁾

Source Normalized Impact per Paper (SNIP): **2.160** ①

SCImago Journal Rank (SJR): **1.656**

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Decision Support Systems

and Electronic Commerce

Editor-in-Chief: James R. Marsden

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The common thread of articles published in *Decision Support Systems* is their relevance to theoretical and technical issues in the support of enhanced decision making. The areas addressed may include foundations, functionality, interfaces, implementation, impacts, and evaluation of decision support systems...

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DATA SCIENCE AND THE A.I. REVOLUTION

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RESPONSIBLE INNOVATION VIA LIFELONG LEARNINC: ARTIFICIAL INTELLIGENCE OPPORTUNITIES AND CHALLENGES





Remarks at Artificial Intelligence – Opportunities and Challenges Forum organized by The New Economy Task Force part of Jobs for America Task Forces ,

United States Congress, The Capitol, Washington DC, November

- 15, 2017
- Invited by U.S. Rep. Darren Soto

- **Invest in research** and innovation: key for economic success
 - AI National Laboratory
- Educate in AI to prepare our workforce for the jobs of the new economy
 - Emphasis on Science Technology Engineering and Mathematics (STEM) education
 - Welcome students from all places, including international students
 - Promote AI from K-12 and beyond
- Lifelong Learning approach to reskill the current technology workforce (UCF examples) and to aid and retrain dislocated non-technology workers so they can also participate in the new economy.



Data Scientist: #1 job in America

25 Best Jobs in America

Jglassdoor

f 34k 🔰 in 10k 🖇 448

Want a new job? Glassdoor is here to help, identifying the 25 Best Jobs in America for 2016. The jobs that make this list have the highest overall Glassdoor Job Score, determined by combining three key factors – number of job openings, salary and career opportunities rating. These jobs stand out across all three categories.

United States v 2016



Data Scientist

Job Openings Median Base Salary Career Opportunity Job Score Glassdoor's Best 25 Jobs List Ranks Data Scientist No. 1



Forbes / Tech

Microsoft Cloud See how the Digital Crimes Unit helps protect the cloud.

JAN 20, 2016 \otimes 02:39 PM 10,734 Views

Report: Why "Data Scientist" Is The Best Job To Pursue In 2016



1.736

4.1

4.7

\$116,840

(Ferenstein Wire) - Data scientists lead the pack for best jobs in America, according to a new report from company review site, Glassdoor. The report is based on voluntary reviews and self-reported incomes of the company's massive dataset; each job is ranked based on a composite score of median reported salary, job openings, and career opportunities.

Gregory Ferenstein CONTRIBUTOR

According to the report, the median salary for a Data Scientist is an impressive \$116,000 and there are over 1,700 job openings. For those curious, a "data scientist"



DATA

Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

hen Jonathan Goldman arrived for work in June 2006 at LinkedIn, the business networking site, the place still felt like a start-up. The company had just under 8 million accounts, and the number was growing quickly as existing members invited their friends and colleagues to join. But users weren't seeking out connections with the people who were already on the site at the rate executives had expected.





Master of Science in Data Analytics

COLLEGE OF ENGINEERING AND COMPUTER SCIENCE COLLEGE OF SCIENCES



MSDA Advisory Board

Seeking Chief Data Officers / Chief Data Scientist (25+)









CAR PRODUCTION

Manager Decisions: ordering parts, hiring/firing, making changes to the production process

DSS for production: where to place new equipment, how to add new product part to production sequence

Use simulation and analysis to develop DSS that allows manager to

Enter parameters

•Run what if scenarios to see how production is affected

•See effects on cost, production time, quality

•Help manager make decisions



RAILROAD CAR MANAGEMENT

Several trains, thousands of railroad cars, ship to several cities

Manager may need to decide: which cars in which trains, in which cities.

Optimization model

Several constrains

Various objectives

Compare resulting distribution plans

Visually display trains on a country map

DSS: Help him make decisions by considering scenarios and possible outcomes

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SOCIAL MEDIA: RECOMMENDER SYSTEMS

Billions of users

Managers decide what information users get to see via automated recommender systems: timelines, wall posts, etc.

Use Machine Learning and Big Data

Optimization model: maximize time on screen, and revenue from adds

DSS: help makes this decisions



FINANCE: ALGORITHMIC TRADING

Use machine learning, deep learning, data analytics

Monitor millions of positions

Realtime model of financial system

User is trader

DSSL assist user in making decisions on what to by and what to sell



TEXTBOOK

Undergraduate Topics in Computer Science

Laura Igual Santi Seguí

Introduction to Data Science

A Python Approach to Concepts, Techniques and Applications







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JUPYTER NOTEBOOKS

💭 jupyter

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8/21/18

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	Document Version: 4.2-8.20.18								
Part	Unit	Lecture	Week	Date	Topics Covered	Topics Covered References		Assignments	
PART I Decision Support Tools: Python EssentialsUnit 1: Introducti 	Unit 1:	Lecture 1.1		08/21 /18	DSS, Data Science, AI, Anaconda, Python	https://docs.python.org/3/tutorial/	DSS-Unit01- Lecture <u>01.2018.ipynb</u>	Final Project and Team Selection Announcement	
	Lecture 1.2	1	08/23 /18	Python Data Structures (Tuples, Lists, Dicts, Sets, etc.)	https://www.coursera.org/learn/python- programming-introduction	DSS-Unit01- Lecture02A.2018.ipynb DSS-Unit01- Lecture02B.2018.ipynb			
	Unit 2: Python Data	Lecture 2.1	3	08/28 /18	Functions in Python	https://docs.python.org/3/tutorial/ https://www.coursera.org/learn/python- programming-introduction	DSS-Unit02- Lecture <u>01.2018.ipynb</u>	HW1 Announcement	
	Structure s and Functions	Lecture 2.2	2	08/30 /18	no class students work on Project Proposal				
	Unit 3: Scientific Computin g with	Lecture 3.1	2	09/04 /18	Basic NumPy	Python Data Science Handbook, Chapter 2: Introduction to NumPy	DSS-Unit03- Lecture <u>01.2018.ipynb</u>	Project Proposal and Team Selection Due	
	Python using NumPy	Lecture 3.2	3	09/06 /18	Advanced NumPy	Python Data Science Handbook, Chapter 2: Introduction to NumPy	DSS-Unit03- Lecture <u>02.2018.ipynb</u>		

	Unit 4: Data Analytics with Python using Pandas	Lecture 4.1		09/11 /18 Introducti n to Panda	Introductio n to Pandas-	Python for Data Analysis, Chapter 5: Getting Started with Pandas, pages:123-165) https://www.tutorialspoint.com/python_pandas	DSS-Unit04- Lecture <u>01.2018.ipynb</u>		
		Lecture 4.2	4	09/13 /18	Series, <u>DataFrames</u>		DSS-Unit04- Lecture <u>02.2018.ipynb</u>	HW1 Due Project Update Reminder	
	Unit 5: Data Analytics: Loading,	Lecture 5.1	F	09/18 /18	Data loading, Data Cleaning, and Preparation	Python for Data Analysis, Chapter 6: Data Loading Storage and File Formats, pages 153-173	DSS-Unit05- Lecture <u>01.2018.ipynb</u>		
	Cleaning and Preparing Data	Lecture 5.2	5	09/20 /18		Python for Data Analysis, Chapter 7: Data Wrangling: Clean, Transform, Merge, Reshape, pages 175-211	DSS-Unit05- Lecture <u>02.2018.ipynb</u>		
PART II Mathemat ical and Statistical Models	Unit 6: Math Modeling: Graphs and Probabilit ies	Lecture 6.1	6	09/25 /18	Data Visualizatio	Python Data Science Handbook, Chapter 4: Visualization with <u>Mathplotlib</u> , pages 217-330	DSS-Unit06- Lecture <u>01.2018.ipynb</u>		
		Lecture 6.2	0	09/27 /18	n and Group Operations	Python for Data Analysis, Chapter 9: Data Aggregation and Group Operations, pages 249-283	DSS-Unit06- Lecture <u>02.2018.ipynb</u>		
	Unit 7: Math Modeling: Linear Program ming	Lecture 7.1		10/02 /18		no class students work on Project Update			
		Lecture 7.2	7	10/04 /18	Linear Programmi ng	https://docs.scipy.org/doc/scipy- 0.18.1/reference/generated/scipy.optimize.linpro g.html https://pythonhosted.org/PuLP/	DSS-Unit07- Lecture <u>01.2018.ipynb</u>	Project Update Due HW2 Announcemen t	

	Unit 8:	Lecture 8.1		10/09 /18	Descriptive Stats	Introduction to Data Science, Chapter 3: Descriptive Statistics, pages 29-50	DSS-Unit08- Lecture <u>01.2018.ipynb</u>	
Mode	Modeling	Lecture 8.2	8	10/11 /18	Statistical Inference	Introduction to Data Science, Chapter 4: Statistical <u>Inference, pages</u> 51-64	DSS-Unit08- Lecture <u>02.2018.ipynb</u>	
PART III Machine Learning Modeling Supervise d Learning and Network Models Unit 10: Network Analysis Unit 11: Machine Learning Regression n	Unit 9: Machine Learning	Lecture 9.1	0	10/16 /18	Supervised Learning: SVM and Random Forest	Introduction to Data Science, Chapter 5: Supervised <u>Learning, pages</u> 67-96 Python Data Science Handbook (pages: 262-266	DSS-Unit09- Lecture <u>01.2018.ipynb</u>	
	Supervise d Learning	Lecture 9.2	9	10/18 /18		311-330, 331-381, 405-432) Python for Data Analysis (pages: 250-264, 373- 378)	DSS-Unit09- Lecture <u>02.2018.ipynb</u>	HW2 Due Final Project Reminder
	Unit 10:	Lecture 10.1	10	10/23 /18	Network Analysis	Introduction to Data Science, Chapter 8: Network Analysis, pages 141-164	DSS-Unit10- Lecture <u>01.2018.ipynb</u>	
	Analysis	Lecture 10.2		10/25 /18		r. Edwin <u>Nassiff</u>		
	Unit 11: Machine Learning	Lecture 11.1		10/30 /18	Regression	Introduction to Data Science, Chapter 6: Regression Analysis, pages 97-114	DSS-Unit11- Lecture <u>01.2018.ipynb</u>	
	Modeling: Regressio n	Lecture 11.2	11	11/01 /18	Analysis	Python for Data Analysis, pages: 250-264, 373-378	DSS-Unit11- Lecture <u>02.2018.ipynb</u>	

	Unit 12: Machine Learning	Lecture 12.1	13	11/06 /18	Unsupervis	Introduction to Data Science, Chapter 7: Unsupervised Learning, pages 115-139	DSS-Unit12- Lecture <u>01.2018.ipynb</u>		
Unsup sed Learni	Unsupervi sed Learning	Lecture 12.2	12	11/08 /18	ed Learning		DSS-Unit12- Lecture <u>02.2018.ipynb</u>		
Final Project		rt	13	11/13 /18		Team Presentations			
PART IV Student's Final Project Presentat ions	Presentations		13	11/15 /18		Team Presentations		Final Project Due	
	Final Project Presentations		14	11/20 /18		no class Thanksgivi	ng		
				11/22 /18		Team Presentations		Final Project Due	
	Final Project Presentations		piect		Team Presentations		Final Project Due		
			15	11/29 /18		Team Presentations		Final Project Due	

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ESI4628-18Fall 000	1 >	Syllabus
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Course Syllabus

Welcome to ESI 4628 **Decision Support Systems for Industrial Engineers!** The goal of this course is to make the student familiar with fundamental methods for building data-driven decision support systems with the popular computer programming Python using the Anaconda distribution. In addition, basic decision support methodology will be presented along with modern data science and machine learning techniques.

Please read the course Syllabus here ESI4628_IEMS_Fall2018_Ivan_Garibay_UGRDv2.3.pdf

Course Summary:

ents	Date	Details	
	Tue Aug 21, 2018	Term Project - Update Report	due by 11:59pm
	Mon Aug 27, 2018	Syllabus Quiz	due by 11:59pm
	Tue Sep 4, 2018	P Term Project - Proposal & Team	due by 11:59pm
IS	Thu Sep 13, 2018	Homework Assignment 1	due by 11:59pm
	Thu Oct 18, 2018	Homework Assignment 2	due by 11:59pm
		📴 Term Project - Files	due by 11:59pm
	Tue Nov 13, 2018	😰 Term Project - Final Report	due by 11:59pm
ide		Term Project - Presentation	due by 11:59pm

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29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

Jump to Today 🛛 🗞 Edit

Assignments are weighted by group:

Group	Weight
Assignments	0%
Homeworks	40%
Semester Term Project	60%
Total	100%







ANNOUNCEMENTS

Confirmation of Academic Activity

- Go to Web Courses Canvas
- Take the "Syllabus Quiz"
- Form Term project group of 5
- Web Courses
 - Main communication
 - Announcements, Assignments,
 - Reading Assignments





The tree that never had to fight For sun and sky and air and light, But stood out in the open plain And always got its share of rain, Never became a forest king But lived and died a scrubby thing.

-**Good Timber** By Douglas Malloch

