Topic – Choosing a University for Master's in USA

TEAM MEMBERS –

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Project Description

The fundamental objective of the project is to help the decision maker choose a university to pursue a master's degree within the United States of America. The decision maker or the user will be asked a series of questions, and based on those responses, the DSS model will suggest a list of top 5 universities among the list of 50 universities (alternatives).

Attributes

- Ranking of the University
- Acceptance Rate
- Tuition and Fees
- Application Fees
- Student Faculty Ratio
- Average Annual Job Salary
- Average Annual Temperature (Uncertain)

Alternatives

We are going to consider a list of the Top 50 Universities from all over the United States of America. These universities are only for a Master's degree in Engineering.

Consequence Table

College Name	Ranking	Acceptance Rate (%)	Tution and Fees ($/Per Year)	Application Fees ($)	Student - Faculty Ratio	Average Alumni Job Salary ($)	Average Annual Temperature (F)			Location
							Min	Max	Mode	
MIT	1	7	57861	125	3	142100	20	82	50.1	Urban
Stanford University	2	6	57861	125	5	122900	36.3	98.2	63.4	Suburban
University of California--Berkeley	3	25	26544	120	4	74700	41.4	79	57.3	Urban
California Institute of Technology	4	7	58843	100	4	124000	46.8	91.8	69.7	Urban
Carnegie Mellon University	5	17	50100	75	10	102700	21.6	82.1	51.7	Urban
Purdue University--West Lafayette	6	30	29132	60	13	61200	20.7	83.3	52.7	Urban
University of Michigan--Ann Arbor	7	26	52098	75	14	74400	17.7	81.4	49.1	Urban
Georgia Institute of Technology	8	21	29140	75	18	82600	35.7	87.8	62	Urban
University of California--San Diego (Jacobs)	9	31	26544	120	12	67900	47.9	77.6	62.1	Urban
University of Illinois--Urbana-Champaign	10	59	36150	70	20	66500	21.3	83.7	53.2	Urban
Texas A&M University--College Station	11	60	23303	65	19	65600	43.6	95.6	68.9	Urban
Cornell University	12	10	29500	105	9	98400	16.6	78.8	47.1	Suburban
University of Southern California (Viterbi)	13	16	50378	90	9	85500	43.8	89.5	63.7	Urban
University of Texas--Austin (Cockrell)	14	32	19320	65	18	68600	43	95.6	68.7	Urban
Columbia University (Fu Foundation)	15	5	52704	85	6	107600	24.2	84.2	53.4	Urban
University of California--Los Angeles (Samueli)	16	14	26544	120	18	70700	43.8	89.5	63.7	Urban
Johns Hopkins University (Whiting)	17	14	54160	75	6	85800	27	85.4	55.3	Urban
University of Pennsylvania	18	6	42312	80	6	123600	26	85.8	54.8	Urban
Northwestern University (McCormick)	19	9	58029	95	6	89800	20.3	81.1	50.2	Urban
University of Maryland--College Park (Clark)	20	45	36891	75	18	68300	28	86.6	56.3	Suburban
Harvard University	21	7	56528	105	7	136700	20	82	50.1	Urban
Princeton University	22	6	53890	95	5	92000	25.6	85.5	54.1	Suburban
University of Washington	23	52	33249	85	20	65800	27.8	87.5	56.6	Urban
Duke University (Pratt)	24	8	55680	95	8	108900	32.9	88.5	60.3	Urban
North Carolina State University	25	46	26421	75	15	57200	34.4	88.2	61	Urban
University of California-Santa Barbara	26	37	27672	120	18	59000	44.3	83.3	61.9	Suburban
University of Colorado--Boulder	27	82	35824	50	18	56900	41.3	104.3	70.2	Urban
University of Wisconsin--Madison	28	52	24054	75	17	64800	12.3	82	47.7	Madison
Rice University (Brown)	29	11	51500	85	6	86400	46.2	92.6	69.6	Urban
Ohio State University	30	52	36276	60	19	50600	27.7	83.3	52.8	Urban
Northeastern University	31	27	48159	75	14	69500	19.7	82	50.1	Urban
Virginia Tech	32	65	27614	75	14	65000	26.6	82.2	53.8	Suburban
Pennsylvania State University--University Park	33	49	39720	65	14	55300	26	85.8	54.8	Suburban
University of California - Davis	34	43	28700	120	20	65200	40.6	93.8	62	Suburban

User Interface of the DSS Model

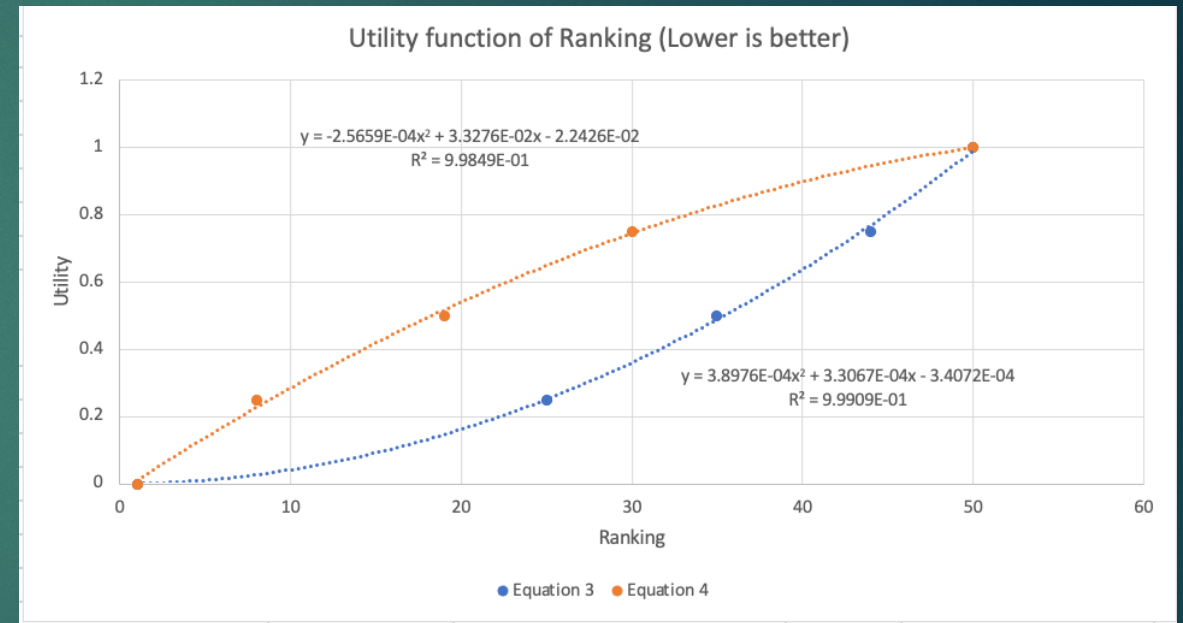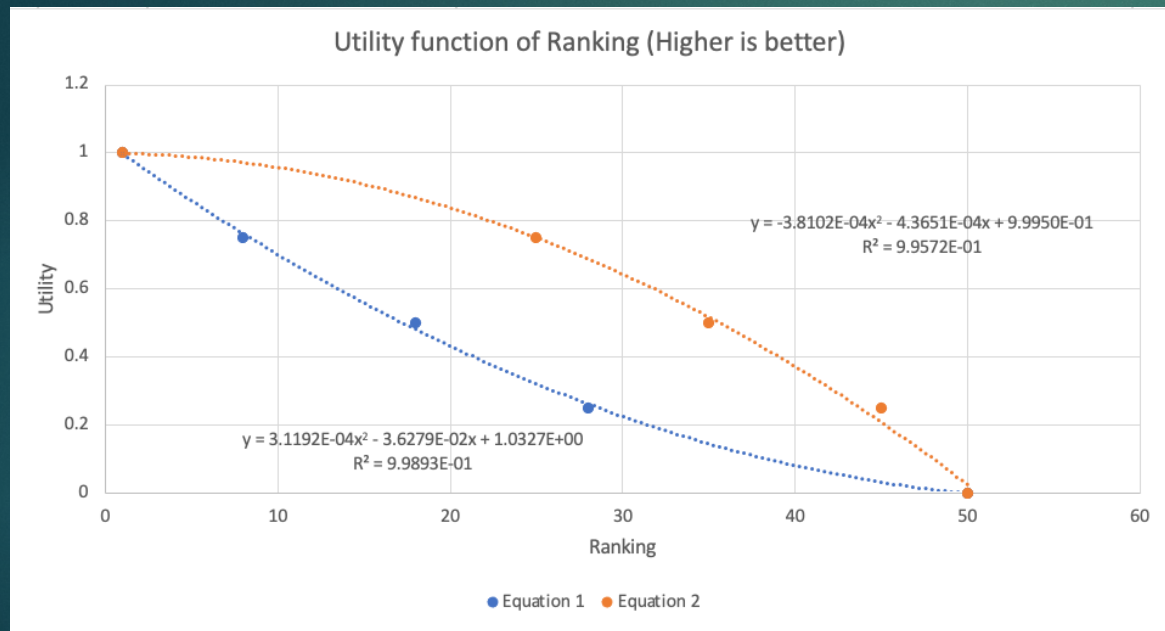| Rate the following based on importance (0 - Lowest, 100 - Highest)		Rating (0 - 100)
Ranking		100
Acceptance Rate		100
Tution and Fees (Per Year)		0
Application Fees		100
Student - Faculty Ratio		100
Average Alumni Job Salary		0
Average Annual Temperature		0
Answer the following questions		**Scale**
What is your preference for Ranking?		1
What is your preference for Acceptance Rate?		1
What is your preference for Tution and Fees?		2
What is your preference for Application Fees?		2
What is your preference for Student - Faculty Ratio?		1
What is your preference for Average Alumni Job Salary?		1
What is your preference for Climatic Conditions?		1

Weights

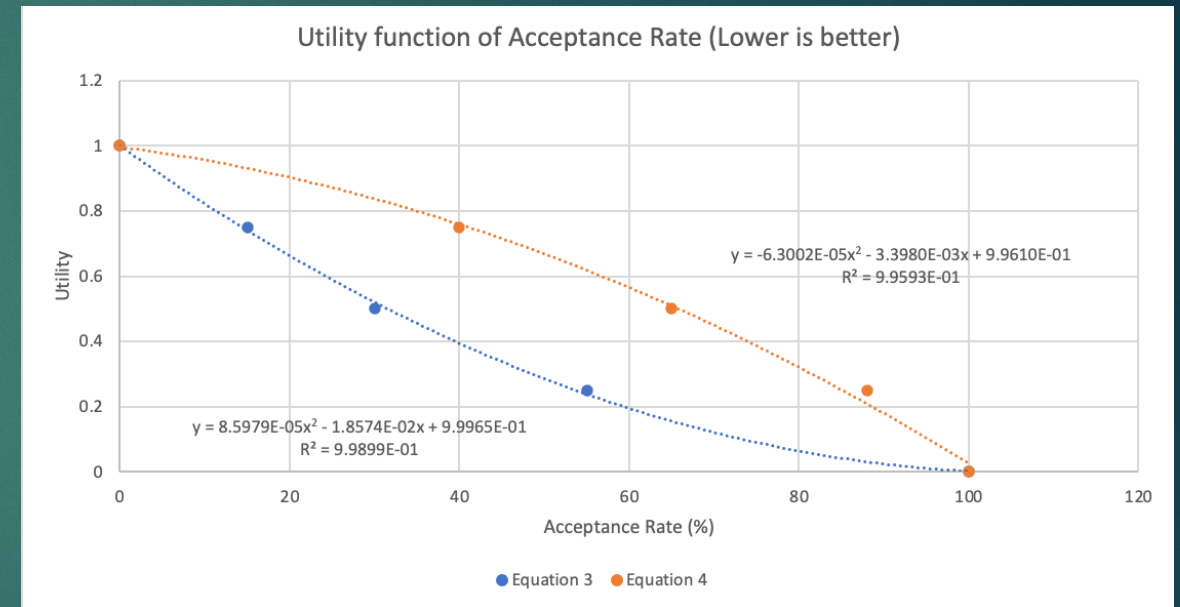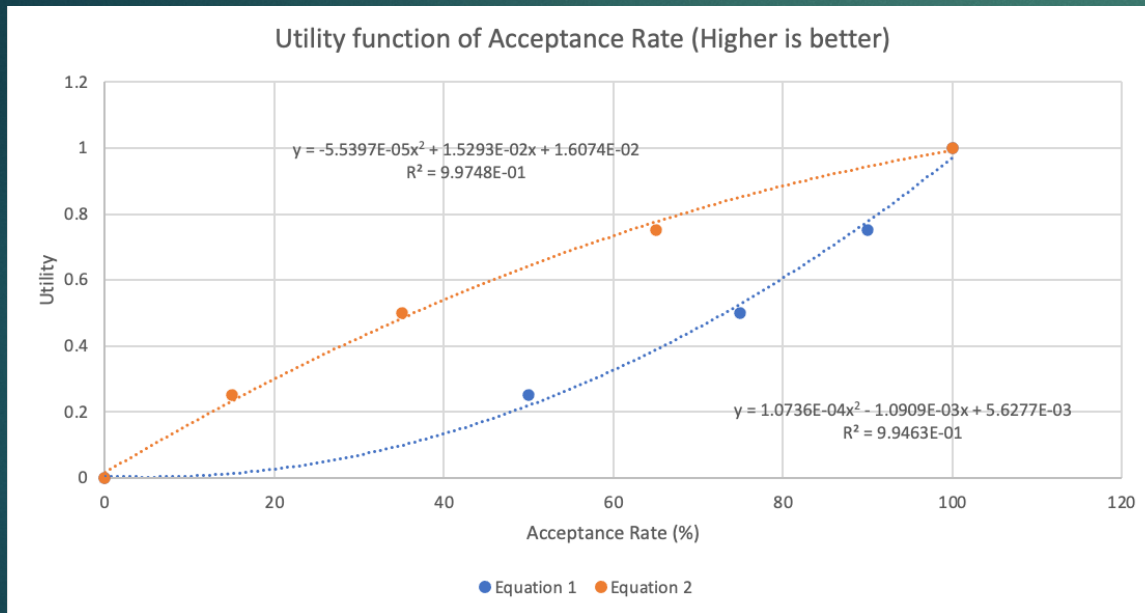| Attributes	Importance	Weights
Ranking	80	0.258064516
Acceptance rate	70	0.225806452
Tution and fees (per year)	55	0.177419355
Application fees	40	0.129032258
Student faculty ratio	35	0.112903226
Alumni job salary after 10 years	20	0.064516129
Average Annual Temperature	10	0.032258065
Total	310	1

Utility Calculation

- We have inculcated different scenarios like Lower is better, Higher is better, Risk Averse and Risk Loving curves for calculating utilities for different attributes.
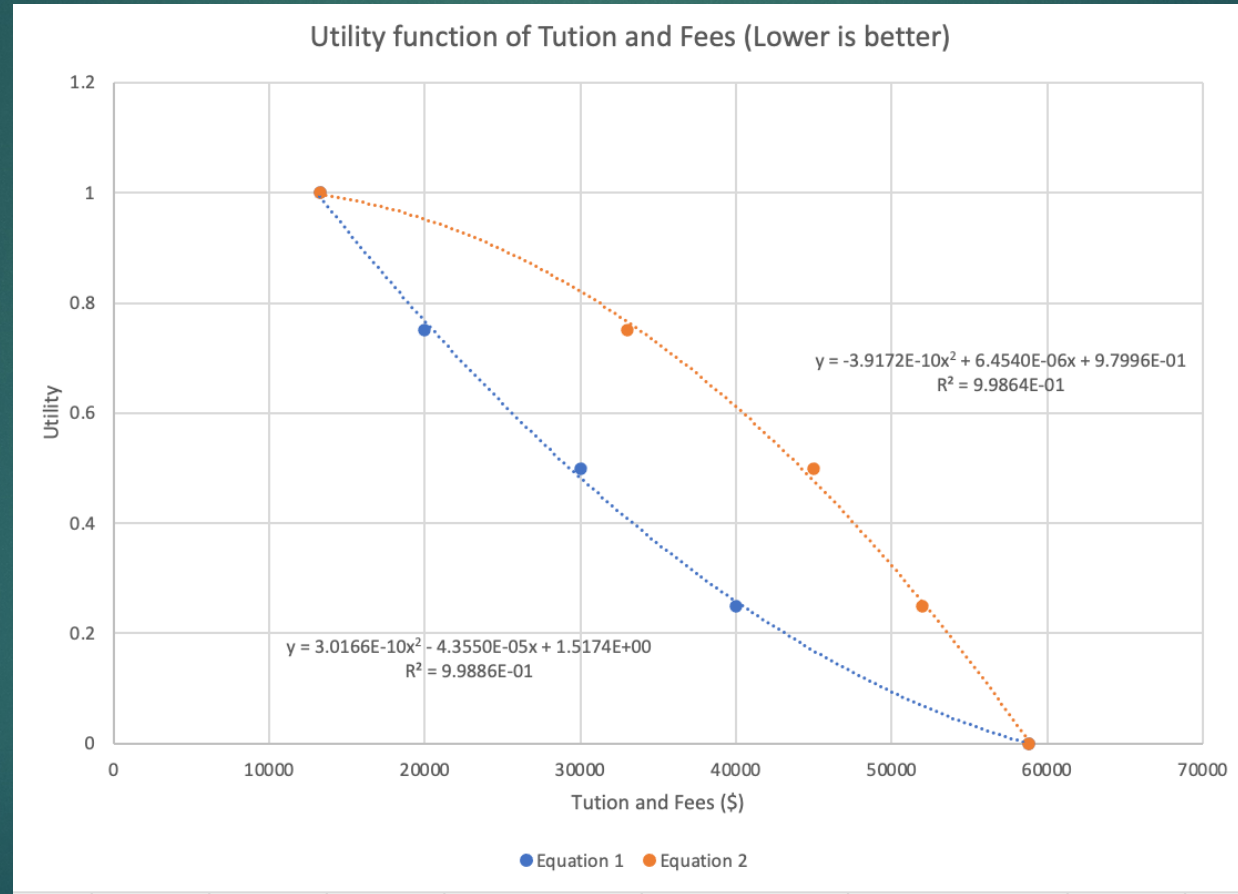
Ranking Attribute

Acceptance Rate Attribute

Utility function of Acceptance Rate (Higher is better)

$y = -5.5397E-05x^2 + 1.5293E-02x + 1.6074E-02$
$R^2 = 9.9748E-01$

$y = 1.0736E-04x^2 - 1.0909E-03x + 5.6277E-03$
$R^2 = 9.9463E-01$

Utility function of Acceptance Rate (Lower is better)

$y = -6.3002E-05x^2 - 3.3980E-03x + 9.9610E-01$
$R^2 = 9.9593E-01$

$y = 8.5979E-05x^2 - 1.8574E-02x + 9.9965E-01$
$R^2 = 9.9899E-01$

Tuition and Fees Attribute

Utility function of Tution and Fees (Lower is better)

$y = -3.9172\text{E-}10x^2 + 6.4540\text{E-}06x + 9.7996\text{E-}01$
$R^2 = 9.9864\text{E-}01$

$y = 3.0166\text{E-}10x^2 - 4.3550\text{E-}05x + 1.5174\text{E+}00$
$R^2 = 9.9886\text{E-}01$

Utility

Tution and Fees ($)

● Equation 1   ● Equation 2

Application Fees Attribute

Utility function of Application Fees (Lower is better)

$y = 4.7533E\text{-}05x^2 - 1.3839E\text{-}02x + 9.9108E\text{-}01$
$R^2 = 9.9906E\text{-}01$

$y = -3.9568E\text{-}05x^2 - 3.0360E\text{-}03x + 9.9992E\text{-}01$
$R^2 = 9.9993E\text{-}01$

Utility

Application Fees ($)

● Equation 1   ● Equation 2
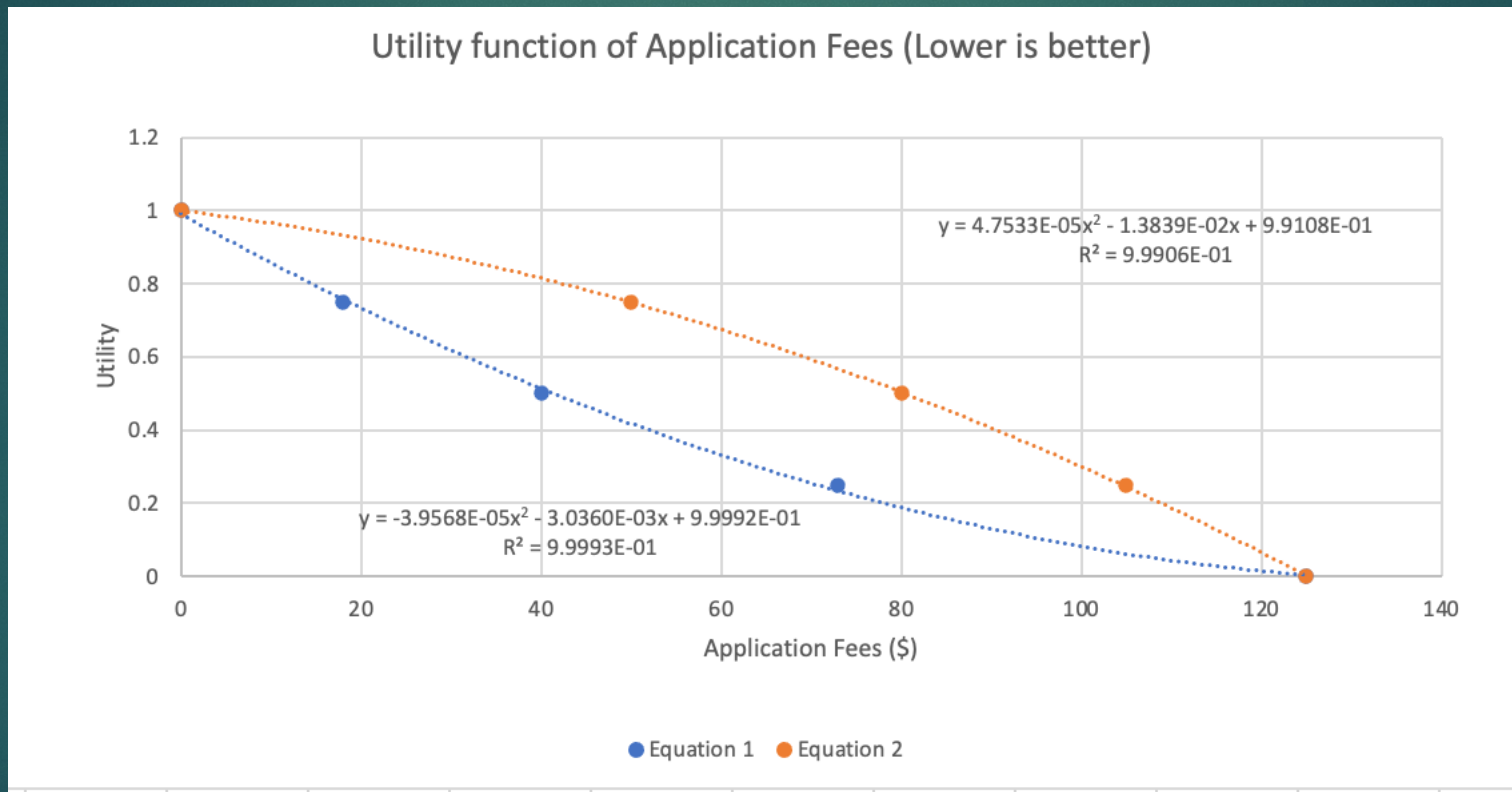
Student Faculty Ratio Attribute

Utility function of Student Faculty Ratio (Higher is better)

$y = -2.2268E-03x^2 + 1.0835E-01x - 2.7891E-01$
$R^2 = 9.9554E-01$

$y = 3.6978E-03x^2 - 2.6513E-02x + 4.5576E-02$
$R^2 = 9.9871E-01$

● Equation 1 ● Equation 2

Utility function of Student Faculty Ratio (Lower is better)

$y = 2.2268E-03x^2 - 1.0835E-01x + 1.2789E+00$
$R^2 = 9.9554E-01$

$y = -2.7068E-03x^2 + 5.6415E-03x + 9.9830E-01$
$R^2 = 9.9445E-01$

● Equation 3 ● Equation 4
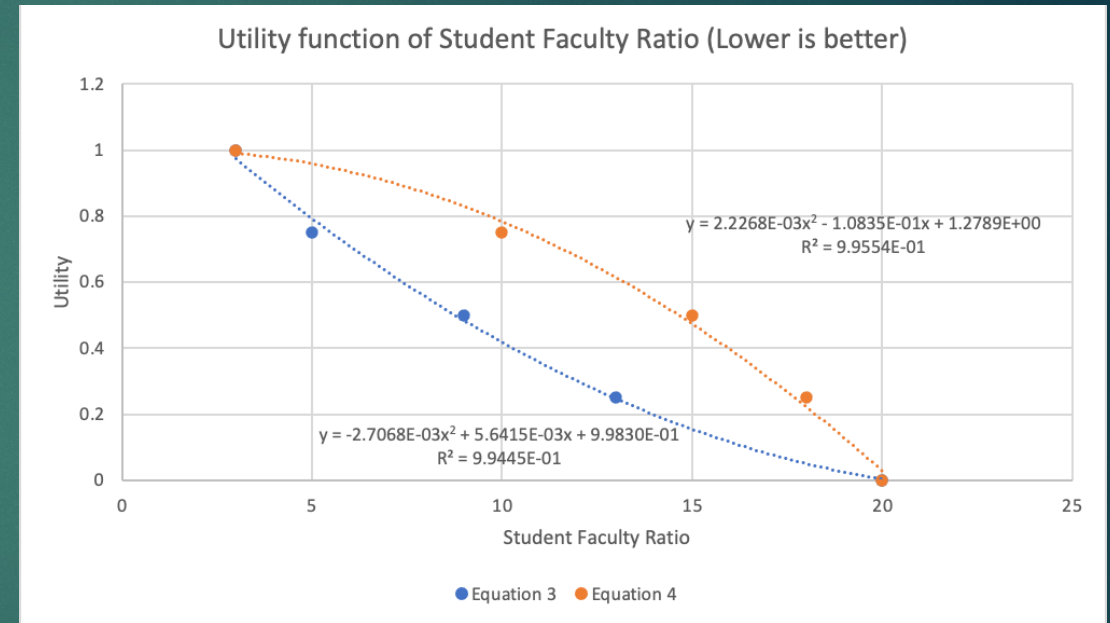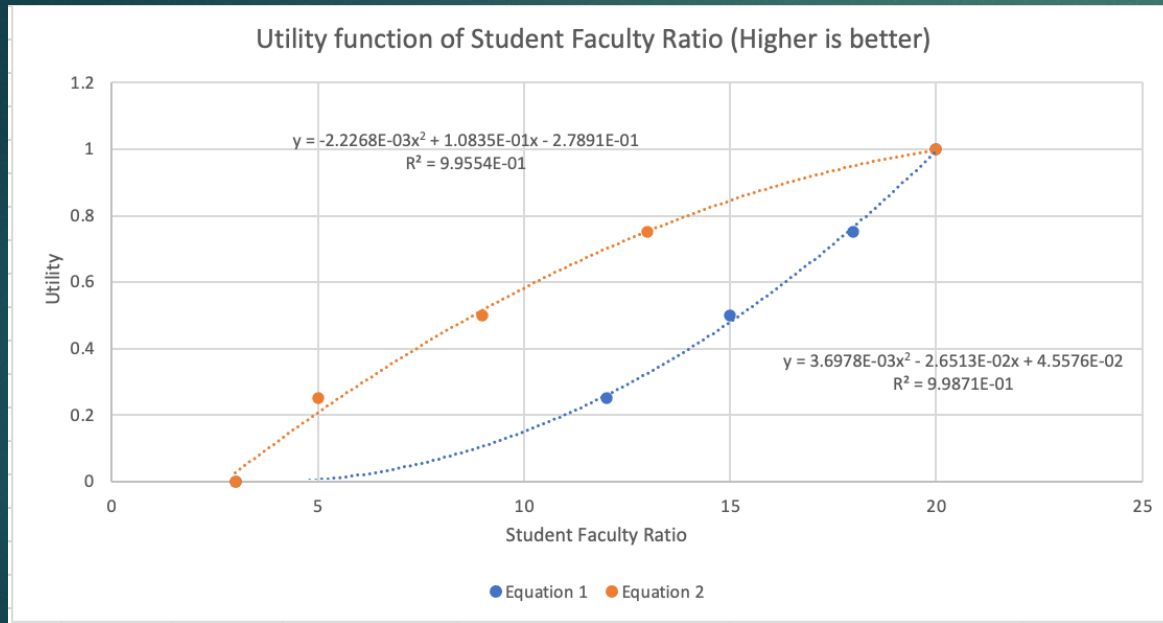
Alumni Job Salary Attribute
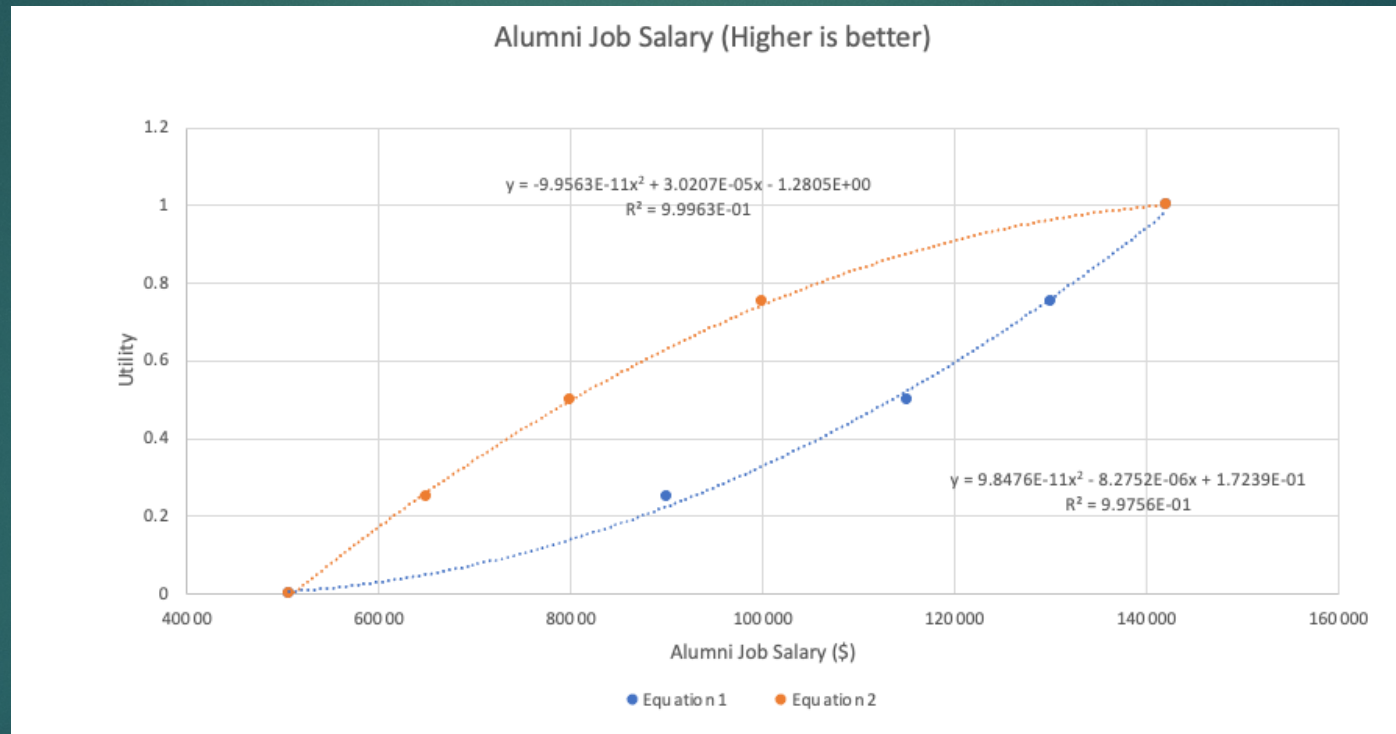
Alumni Job Salary (Higher is better)

$y = -9.9563\text{E-}11x^2 + 3.0207\text{E-}05x - 1.2805\text{E+}00$
$R^2 = 9.9963\text{E-}01$

$y = 9.8476\text{E-}11x^2 - 8.2752\text{E-}06x + 1.7239\text{E-}01$
$R^2 = 9.9756\text{E-}01$

Utility

Alumni Job Salary ($)

• Equation 1   • Equation 2

Average Annual Temperature Attribute
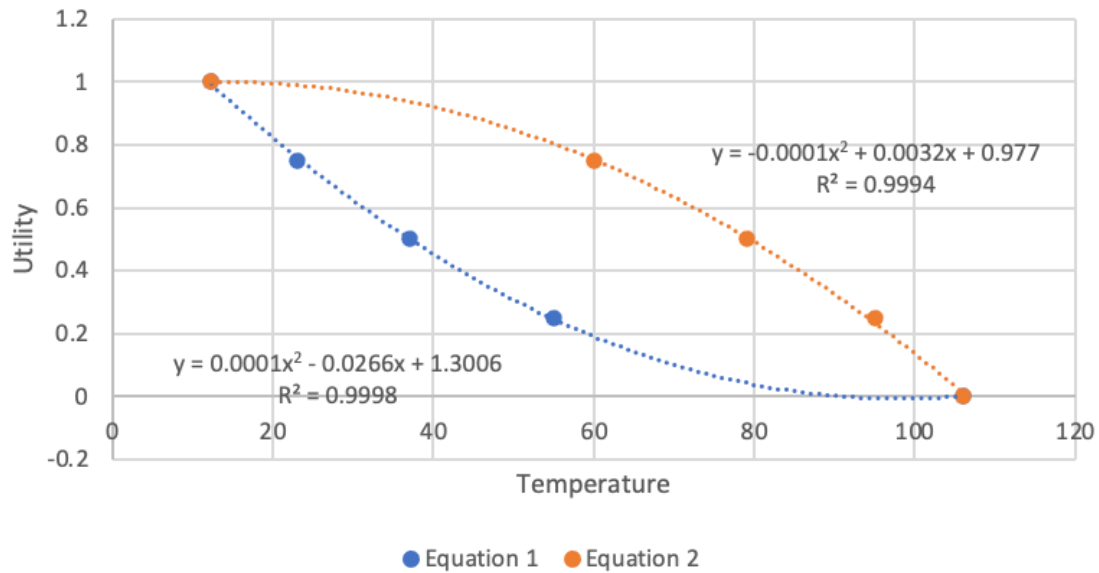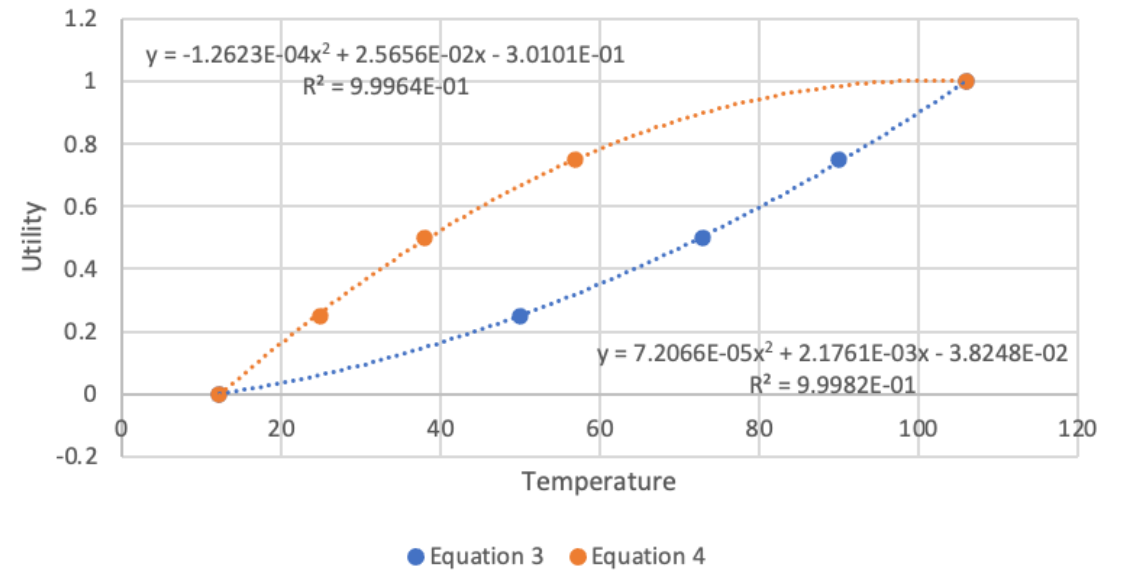
Average Annual Temperature Attribute
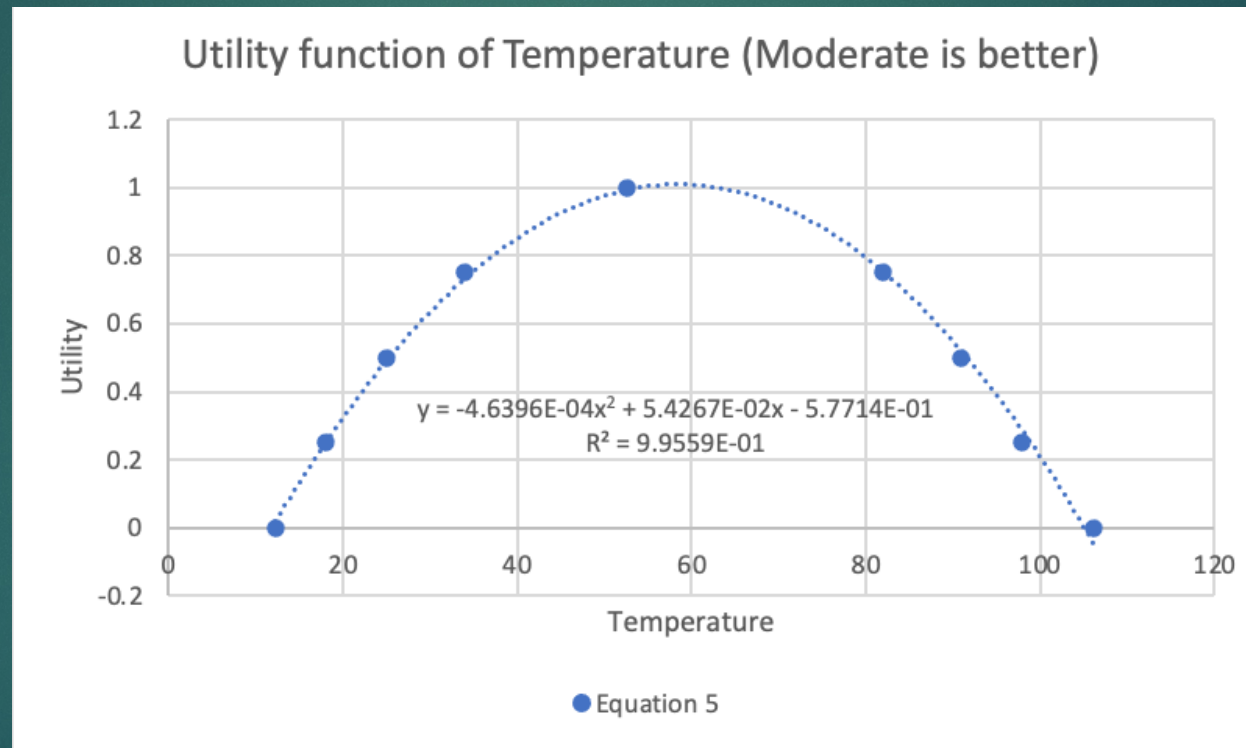
Monte Carlo Simulation

College Name		MIT	Stanford University	University of California--Berkeley	California Institute of Technology	Carnegie Mellon University	Purdue University--West Lafayette
Min		20	36.3	41.4	46.8	21.6	20.7
Max		82	98.2	79	91.8	82.1	83.3
Mode		50.1	63.4	57.3	69.7	51.7	52.7
Random	Static	Triangular Distribution	Triangular Distribution	Triangular Distribution	Triangular Distribution	Triangular Distribution	Triangular Distribution
0.718060959	0.869485344	60.28192583	74.4910064	64.19941047	76.73333671	61.391661	62.43431491
0.283365579	0.907821067	61.16036534	75.32384863	64.69660376	77.38610157	62.25940917	63.34442708
0.514765047	0.798864375	58.6114063	72.90719875	63.25390303	75.49198038	59.74147309	60.70356379
0.913815927	0.595093437	53.32511625	67.89530488	60.2618838	71.56375956	54.51952163	55.22667337
0.331092407	0.606130938	53.63274531	68.1869658	60.43600064	71.79235747	54.82340659	55.54539418
0.307612858	0.906471168	61.12975194	75.29482428	64.67927669	77.36335288	62.22916836	63.3127099
0.253801049	0.892137459	60.80327101	74.98529004	64.49448978	77.12074622	61.90666098	62.9744575
0.282135369	0.428000083	48.26187813	63.09488496	57.39611108	67.80128772	49.51790737	49.98087716
0.948678783	0.953226949	62.17715177	76.28785658	65.27210085	78.14167147	63.26382046	64.39787436
0.974849646	0.911563932	61.24512831	75.40421179	64.74457926	77.44908859	62.3431405	63.43224623
0.002596969	0.453926115	49.105273	63.89450161	57.87346924	68.42801104	50.35103741	50.85468113
0.349881821	0.944539175	61.98450916	76.1052135	65.16306589	77.99851952	63.07352246	64.1982859
0.204693391	0.846196587	59.73879806	73.97607083	63.89200231	76.32974065	60.85514355	61.87160433
0.64370865	0.374318533	46.43015788	61.35824406	56.35936468	66.44014379	47.70848069	48.08311313
0.907759935	0.615535378	53.89265587	68.43338514	60.58310898	71.98549596	55.08015382	55.81467597
0.473481161	0.402945397	47.42219358	62.29878603	56.92085295	67.17732151	48.68844248	49.11091727
0.441117084	0.190058309	38.83313081	54.15555691	52.05947744	60.79482359	40.20391581	40.21217067
0.349399524	0.816403728	59.03296859	73.30687895	63.49250562	75.80524163	60.15790462	61.14032577
0.339369691	0.808043952	58.83261031	73.11692069	63.37910363	75.65635619	59.95998487	60.93274344
0.651842729	0.033656725	27.92528743	43.81390846	45.8856813	52.68924915	29.42883004	28.91103844
0.578974077	0.876489186	60.44383906	74.64451517	64.29105272	76.85365378	61.55160361	62.60206602
0.666458991	0.132081279	35.70000261	51.18506043	50.2861393	58.46660866	37.10892041	36.96607565

Results

Results						
Universirty	Ranking	Acceptance Rate (%)	Tuition and Fees ($/year)	Application Fees ($)	Student Faculty Ratio	Average Alumni Job Salary	Utility
University of Texas--Austin (Cockrell)	14	32	19320	65	18	68600	0.70670819
Georgia Institute of Technology	8	21	29140	75	18	82600	0.700594408
Texas A&M University--College Station	11	60	23303	65	19	65600	0.665181576
University of California--Los Angeles (Samueli)	16	14	26544	120	18	70700	0.664926361
Purdue University--West Lafayette	6	30	29132	60	13	61200	0.66134556

Concepts Used

- Certainty Equivalent Method
- Multi Attribute Utility Theory (MAUT)
- Monte Carlo Simulation

Comments

If there are any questions or any suggestions, we would appreciate it.