



JMP-START INTO TEACHING APPLIED STATISTICS

UKCOTS 2024, Manchester

Volker Kraft, JMP Global Academic Program



Abstract

Today's curricula often require students to learn a range of **analytics skills**, which are critical for all **practitioners** who want to learn from data. With the right **software**, learning these skills can be **hands-on and engaging**, allowing students to explore and analyze realistic data without struggling with a clunky or tedious statistics tool. JMP is **interactive** and powerful **point-and-click** software for **solving real-world problems**. It is ideal for engaging, hands-on teaching of relevant data skills in various fields and is also used by scientists and engineers at **leading companies** across the globe.

While the fundamental **skills** addressed in this session include understanding variation and uncertainty, we will also look at applications like **data modeling**, **designing experiments** and **quality management** – all from a student's perspective.

This interactive session will demonstrate how JMP can help to **engage students' curiosity** and teach **relevant data skills** which are most in-demand in industry today. We'll guide you through a series of **brief demonstrations**, so that you can directly experience the difference JMP can make for your course. Participants will receive a **free license** before the **workshop**, and the presenters will provide **sample data** and lead you through several hands-on examples in JMP.

We will also discuss **best practices** and share **resources** to support integration into modern statistics courses.

Agenda

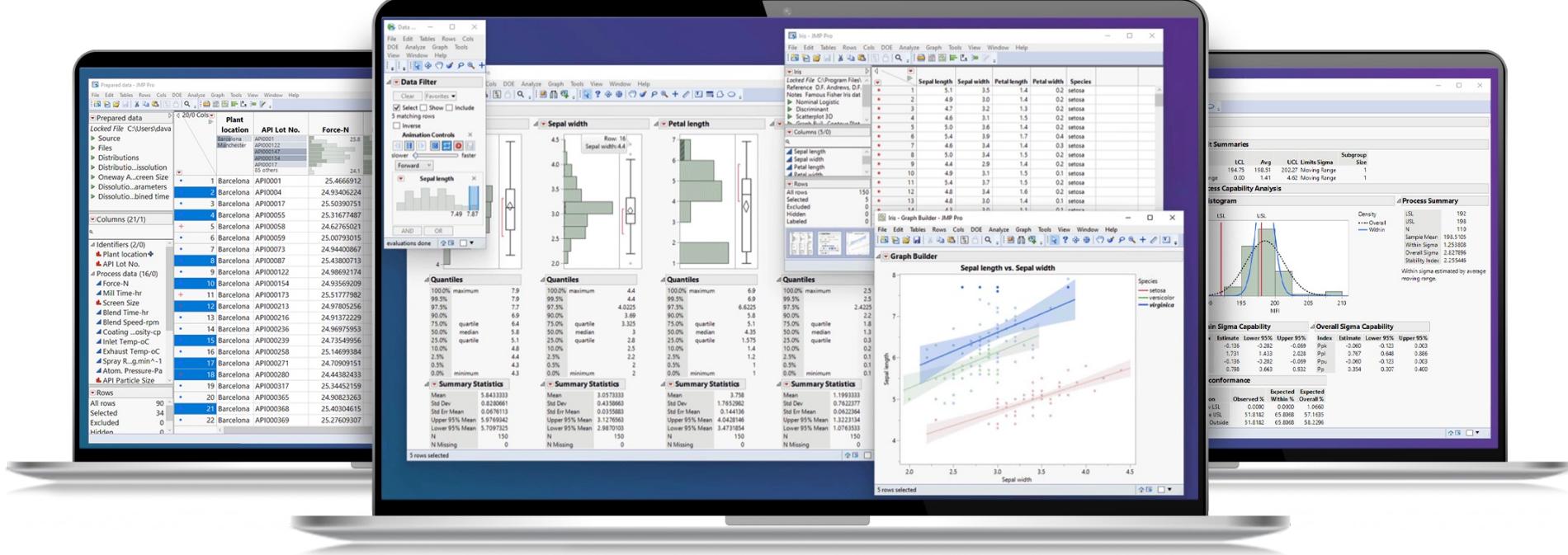
1. Live demo: Teaching examples in JMP

2. Access for academic use:

- Free resources
- Free software

3. Discussion

1. Live demo: Teaching examples in JMP



JMP® software combines interactive visualization with powerful statistics, without the need for coding.

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Demonstration:

Enhanced Datasets



Datasets useful for demonstrating statistical techniques and JMP platforms.

Complemented with descriptive storylines, exercises, and supplemental materials, these enhanced datasets are designed to engage students in the process of problem solving through statistical analyses.

[View Enhanced datasets](#)

In addition, JMP comes with over 500 sample data sets included in the software, accessible through the JMP Help menu. Other datasets can be found in the [JMP User Community](#) and in [JMP Public](#).

jmp.com/courses

- > Introductory Statistics
- > Enhanced Datasets

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JMP® ENHANCED DATASETS

PENGUINS : SEX AND SPECIES COMPARISON

RELEVANT JMP PLATFORMS AND STATISTICAL TECHNIQUES

Graph Builder & Graphs : Comparative Dotplots ; 3D Scatterplot

Multivariate : Scatterplot Matrix

Fit Y by X : One-Factor ANOVA

Distribution : Univariate analyses, Confidence Intervals for the Population Mean, Tolerance Intervals for proportions of a Population.

PROBLEM STATEMENT

To better understand similarities and differences in morphological features between males and females of different penguin species, a researcher from Simon Fraser University in collaboration with The Palmer Station Antarctica Long Term Ecological Research Network obtained measurements on a sample of penguins from three different species [1].

The dataset consists of measurements across 4 physical features of 34 male and 34 female Chinstrap penguins, 71 male and 72 female Adélie penguins, and 61 male and 58 female Gentoo penguins.



Demonstration:

Instead of watching the live demo at UKCOTS-2024, we suggest our on-demand resources:

- [JMP in 2 Minutes](#) (2 min, YouTube)
- [JMP 101: Intro to JMP for Teachers](#) (60 min)
- [Intro to JMP for Students](#) (60 min)
- [New in JMP 18 and JMP Pro 18 for Academics](#) (60 min, incl. Python integration and Deep Learning)

2. Access for academic use:

- Free resources**
- Free licenses**
- Free support**

'STIPS' MOOC

The screenshot shows the landing page for the 'Statistical Thinking for Industrial Problem Solving' MOOC. At the top left is the JMP logo with the tagline 'Statistical Discovery - From SAS'. Below the logo, the course title 'Statistical Thinking for Industrial Problem Solving' is displayed in large white text. Underneath the title, it says 'A free online course'. A call-to-action button 'Learn more and enroll today:' is followed by the website 'jmp.com/statisticalthinking'. The main content area features several course modules with icons and descriptions:

- Statistical Thinking and Problem Solving**: Learn how to map a process, define and scope your project, and determine the data you need to solve your problem.
- Exploratory Data Analysis**: Learn how to describe data with graphics and use interactive visualizations to find and communicate the story in your data.
- Quality Methods**: Learn about tools to quantify, control and reduce variation in your product, service or process.
- Decision Making With Data**: Learn to draw inferences from data, construct statistical intervals, perform hypothesis tests, and understand the relationship between sample size and power.
- Correlation and Regression**: Learn how to study the linear association between pairs of variables, and how to fit and interpret linear and logistic regression models.
- Design of Experiments**: Learn the language of design of experiments (DOE) and see how to design, conduct and analyze an experiment in JMP.
- Predictive Modeling and Text Mining**: Learn how to identify possible relationships, build predictive models and derive value from free-form text.

Free, online, self-paced statistics course:

- Ideal for anyone wanting to learn fundamental skills around core statistical applications.
- Shaped by industry experts.
- Helps drive statistical adoption and comprehension.



www.jmp.com/statisticalthinking

Teaching Libraries

Teach with JMP

Use JMP's capabilities and teaching resources more effectively in your course

- › JMP 101: Intro to JMP for Teachers
- › JMP 101: Intro to JMP for Students
- › Resources for Teaching with JMP
- › Univariate Statistics and Probability
- › Statistical Inference
- › Exploratory Data Analysis
- › Regression and ANOVA
- › Advanced Regression
- › Categorical Data Analysis
- › Predictive Modeling
- › Clustering
- › Multivariate Methods, Pt. 1
- › Multivariate Methods, Pt. 2
- › Mixed Models
- › Text Mining
- › Statistical Quality Control
- › Survival and Reliability
- › Design of Experiments

JMP for Your Discipline

See how JMP's capabilities and resources align with your discipline

- › Teaching Analytics in Chemistry and Chemical Engineering with JMP
- › Teaching Engineering Statistics with JMP
- › JMP Pro for Teaching Business Analytics and Data Science
- › Better Teaching (and Using) Materials Science
- › JMP for Teaching Statistics in Life Sciences

The screenshot shows a JMP help page titled "Support Vector Machines - Classification". The page includes a brief introduction, a step-by-step guide for creating an SVM model, and several screenshots of JMP interface components such as the Model Launch control panel and a Response Profile Plot.

- **Learning Library:** 100+ “how-to” one-page guides and videos
 - www.jmp.com/learn
- **Case Study Library:** 60+ real-world problems with practical multistep solution paths
 - www.jmp.com/cases
- **Academic Webinar Library:** 40+ on-demand and live webinars
 - www.jmp.com/webinar
- **Course Materials by course type**
 - www.jmp.com/courses

Other Resources



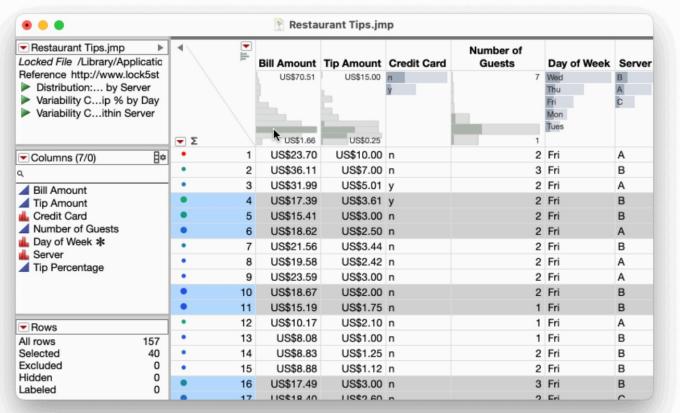
The JMP data table grid

Data tables store and structure your data. Rows contain observations and columns contain variables.

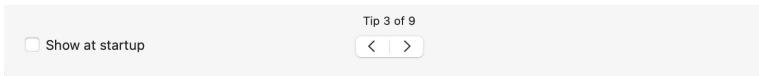
In the data table grid at right, you can:

- select columns, rows, or cells
- get options by right-clicking a column, row, or cell
- see interactive graphs or statistics for columns

This example opens header graphs and statistics for the columns in the data table.



For more information, see the **Data Grid in Data Tables** topic in the JMP Online Help.



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- **Quick Start:** Built-in tips to learn the basics of JMP
 - *Help menu*
- **Teaching Modules:** Interactive demos for statistical concepts
 - *Help menu > Sample Index*
- **Enhanced Datasets:** 20+ demos incl. background, exercises, links
 - *See course materials*
- **On-demand courses:** 7+ in-depth foundational online courses
 - *See course materials*

On-demand courses: Statistical Decisions Using ANOVA and Regression

MENU TEXT VERSION

- ▶ Combining Factors
- ▼ Model Interpretation
 - Introduction (0:04)
 - Linear Model (0:23)
 - Interpreting Linear Mo...
 - Centering (0:29)
 - Coding (1:01)
 - Example: Neutralizatio...
 - Demo: Model Interpret... ✓
 - Demo: Model Interpret...
 - ▶ When Things Go Wrong
 - ▶ Course Complete

The image shows two overlapping JMP software windows. The left window is titled 'Compound - Fit Least Squares - JMP' and displays a 'Residual by Predicted Plot' and a 'Studentized Residuals' plot. Below these are tables for 'Parameter Estimates' and 'Effect Tests'. The right window is also titled 'Compound - Fit Least Squares 2 - JMP' and shows similar plots and tables, with some differences in the parameter estimates.

Parameter Estimates (Left Window):

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	37.875	2.263362	16.73	<.0001*
Relative Humidity(0.25,0.75)	-5.4125	1.297771	-4.17	0.0059*
Exposure Time(30,120)	7.4	1.421637	5.21	0.0020*
Relative Humidity*Relative Humidity	-9.3375	2.247806	-4.15	0.0060*
Relative Humidity*Exposure Time	8.1375	1.741143	4.67	0.0034*
Exposure Time*Exposure Time	-1.35	2.384158	-0.57	0.5918

Parameter Estimates (Right Window):

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	36.366667	4.180153	8.70	0.0001*
Relative Humidity uncoded	-21.65	5.191085	-4.17	0.0059*
Exposure Time uncoded	0.164444	0.031592	5.21	0.0020*
(Relative Humidity uncoded-0.5)*(Relative Humidity uncoded-0.5)	-149.4	35.96489	-4.15	0.0060*
(Relative Humidity uncoded-0.5)*(Exposure Time uncoded-75)	0.723333	0.154768	4.67	0.0034*
(Exposure Time uncoded-75)*(Exposure Time uncoded-75)	-0.00667	0.001177	-0.57	0.5918

Teaching modules: One-Way ANOVA

Demonstrate One-Way ANOVA

Population Characteristics

Number of Groups Two Three

Group 1 Mean: 26,00
Group 2 Mean: 28,00
Group 3 Mean: 30,00
Grand Mean: 28,00
Standard Deviation: 2,00

Name of Y: Response
Name of X: Factor

[Restore Default Settings](#)

Demo Characteristics

Sample Size: 5
Number of Samples: 100
Alpha: 0,05

Run Simulation

[Draw Additional Samples](#) [Reset Samples](#)

[Help](#) [More Info](#) [Restart Demo](#)

Sample Data

Distribution of Test Statistics

Summary of Fit

Statistic	Estimate
R Square	0,48687
RMSE	1,99707
Mean Response	27,5272
Obs. per Group	5

Oneway ANOVA: Current Sample

Analysis of Variance

Source	DF	SS	MS	F Ratio	Prob > F
Model	2	45,4098	22,7049	5,69287	0,0183*
Error	12	47,8597	3,98831		
Total	14	93,2695			

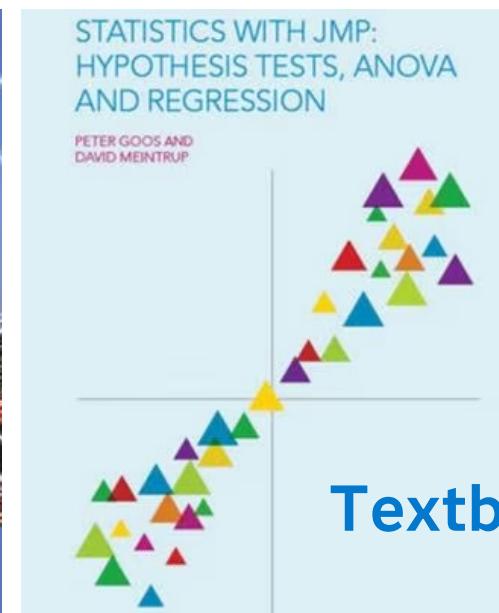
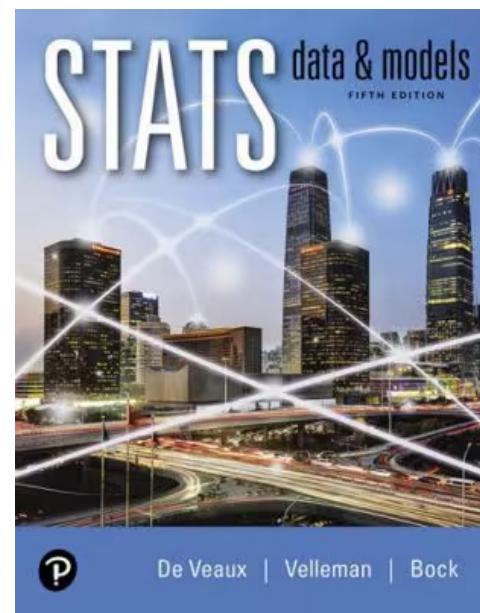
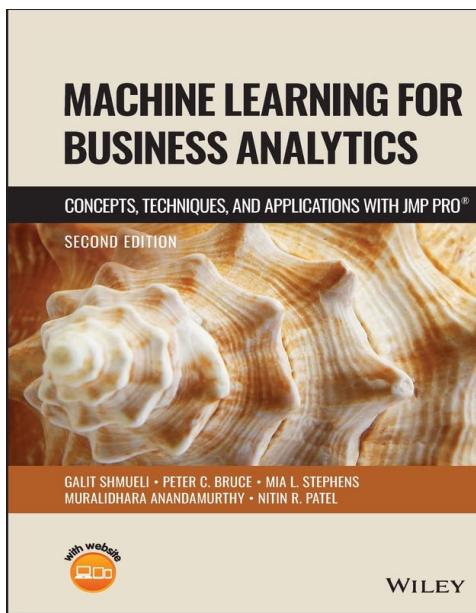
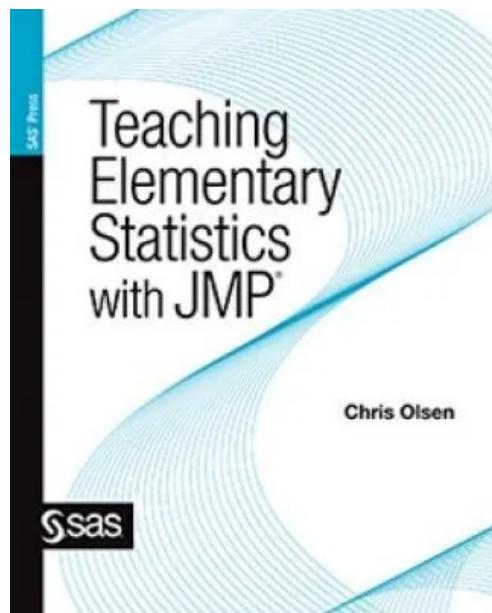
Means for Oneway ANOVA

Group	Number	Estimate	Stderr	Lower 95%	Upper 95%
1	5	26,0043	0,89312	23,5246	28,484
2	5	26,6148	0,89312	24,1351	29,0945
3	5	29,9624	0,89312	27,4827	32,4421

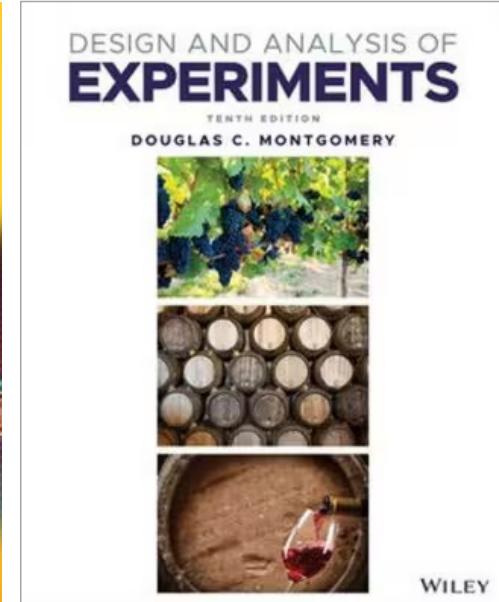
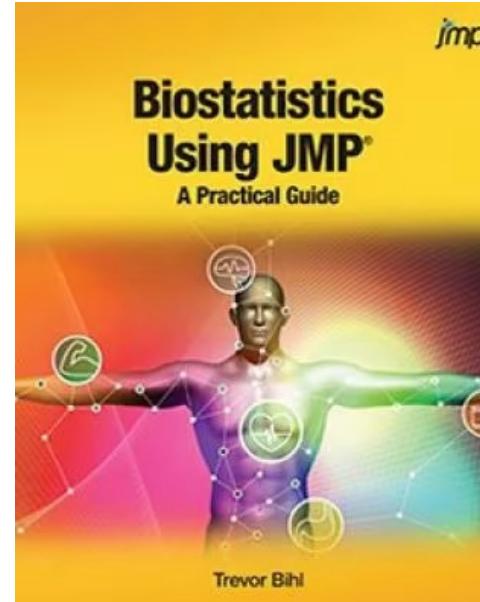
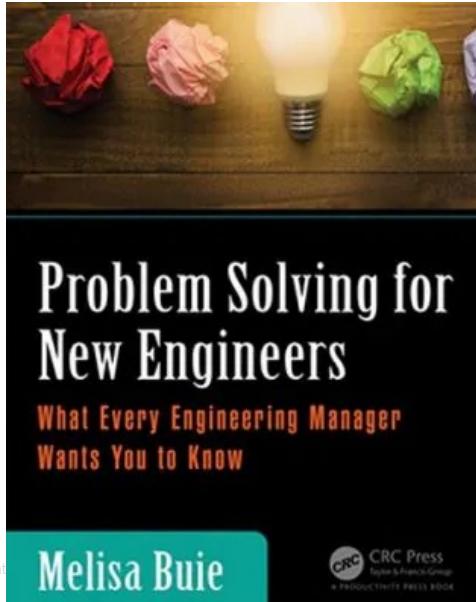
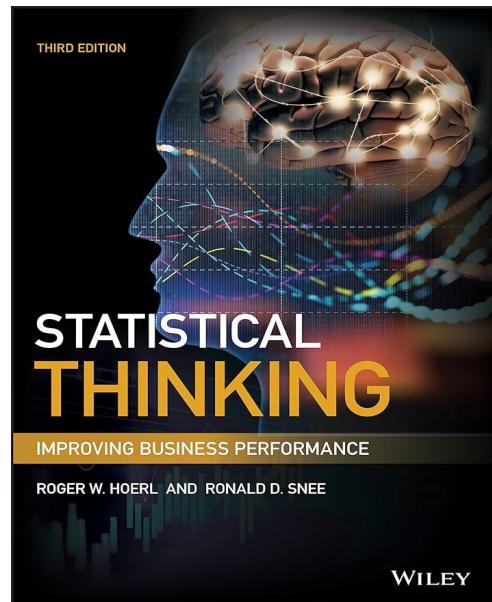
Std Error uses a pooled estimate of Error Variance.

Power (Probability of Rejecting H0 when it is False)

Power = $1 - \beta$ $\beta = P(\text{Type II Error})$



Textbooks



jmp

JMP User Community

Welcome to the JMP User Community!

Ask questions, get answers, meet other JMP users



Ask a Question



Learn JMP



Get Support

Learning Resources

Find courses, tutorials, and lots of other methods of learning JMP.



Minute Guides



Live Learning Events



Mastering JMP
recordings



On-Demand e-Courses

[view all learning resources >](#)

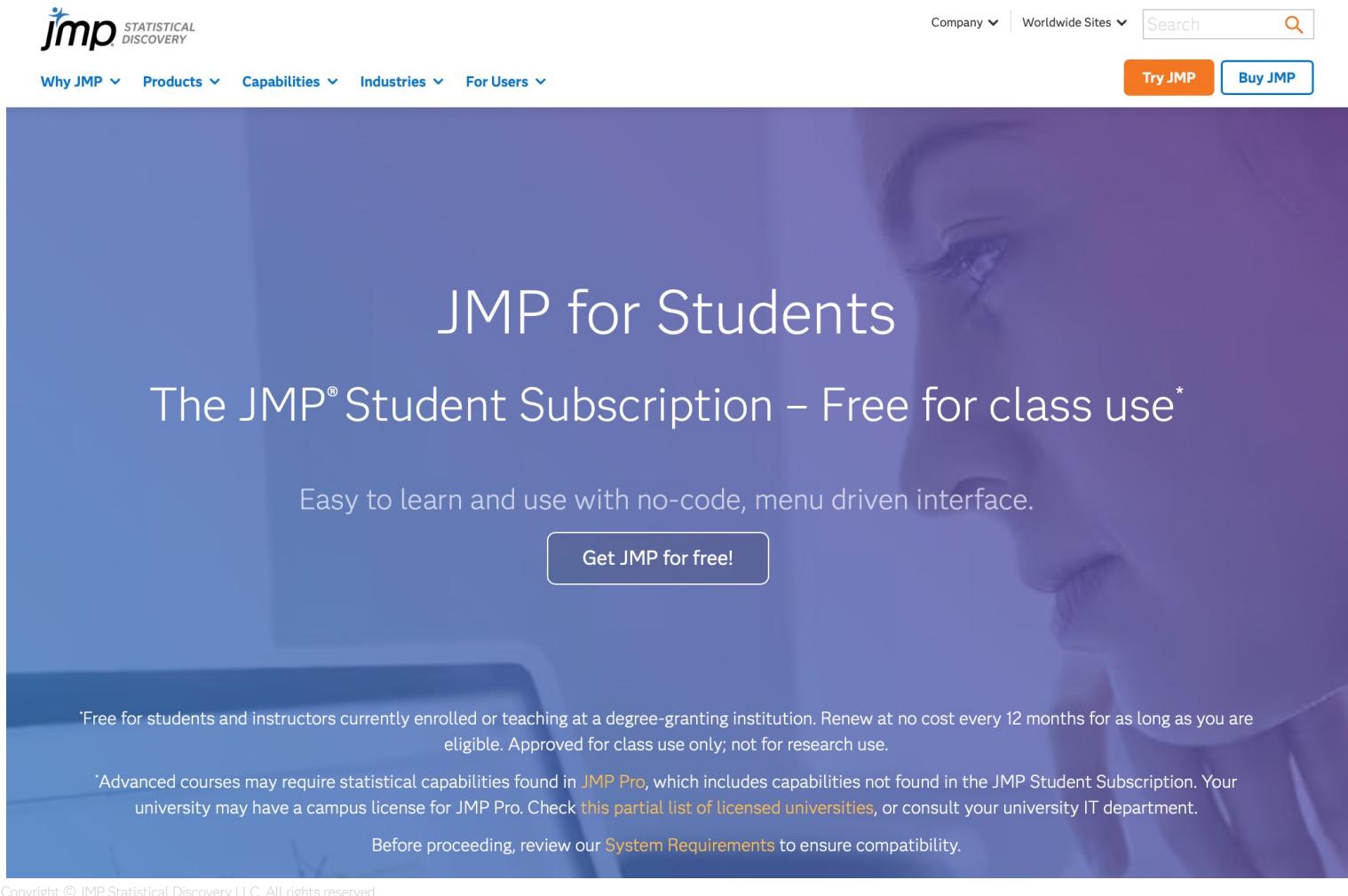
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Networking with 50.000+ registered JMP users and experts:

- “Learn JMP” space
- Discussion forums
- Add-ins, data sets, etc.
- Blog posts
- Free in-depth e-courses

<http://community.jmp.com/>

Free access to JMP software: jmp.com/student



The screenshot shows the JMP website homepage. At the top left is the JMP logo with the tagline "STATISTICAL DISCOVERY". The top right features a search bar and dropdown menus for "Company" and "Worldwide Sites". Below the header are navigation links: "Why JMP", "Products", "Capabilities", "Industries", and "For Users". A large central banner has a blue-to-purple gradient background with a profile of a person's head. The text "JMP for Students" is displayed in white, followed by "The JMP® Student Subscription – Free for class use*". Below this, a subtitle reads "Easy to learn and use with no-code, menu driven interface." A button labeled "Get JMP for free!" is centered at the bottom of the banner. At the bottom left, a note states: "'Free for students and instructors currently enrolled or teaching at a degree-granting institution. Renew at no cost every 12 months for as long as you are eligible. Approved for class use only; not for research use.'". At the bottom center, another note says: "'Advanced courses may require statistical capabilities found in JMP Pro, which includes capabilities not found in the JMP Student Subscription. Your university may have a campus license for JMP Pro. Check [this partial list of licensed universities](#), or consult your university IT department.'". At the very bottom left, a copyright notice reads "Copyright © JMP Statistical Discovery LLC. All rights reserved."

- Full version of JMP 18
- Free for class use
- Individual licenses for students and instructors
- 12 months, renewable



Other academic licensing options

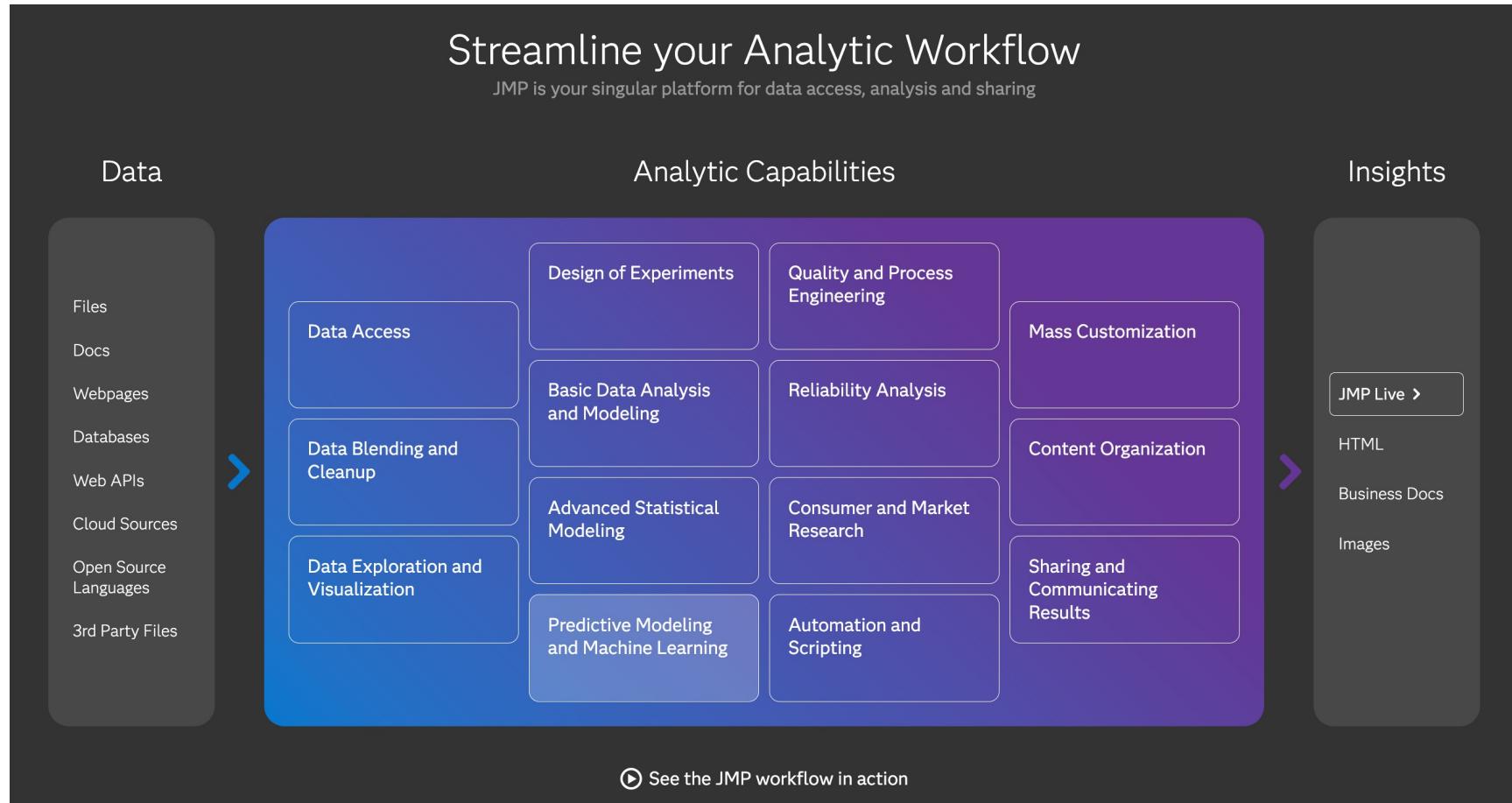
- Academic Suite License for **teaching**
 - Site licenses (campus-wide) at a degree-granting institution
 - Multi-user: Unlimited number of academic users, incl. home use; for classrooms, labs and research groups
 - **JMP Pro*** for Windows, Mac, and JMP for the Cloud; JMP Technical Support; free version upgrades; complimentary virtual and in-person workshops
 - *) more ML, e.g. Deep Learning; Functional DA; Text Analytics; etc.
- Single-user JMP or JMP Pro license for **research**

Please send requests to academic@jmp.com

3. Discussion

JMP provides all analytic capabilities...

jmp.com/workflow



...solving real-world problems... (1/2)

jmp.com/en_us/industries.html



Chemical



Consumer Products



Pharmaceutical



Semiconductor

- Biotechnology
- Clean Energy and Conservation
- Government

- Industrial Manufacturing
- Medical Devices
- Medical Statistics

All 10 of the world's largest **chemical companies** use JMP.

All 20 of the world's largest **pharmaceutical companies** use JMP.

All 25 of the world's largest **semiconductor companies** use JMP.

22 of the world's top 25 **consumer product companies** use JMP.

...solving real-world problems... (2/2)

<http://jmp.com/success>

Our Customers

See why leading companies from around the world are empowered by JMP

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Feature Articles



VIDEO
Murata Finland
Analytics enablement drives innovation forward.

PARTNERSHIP
BASF + KU Leuven
How BASF identified a gap in engineering education, then designed a course to fill it with KU Leuven.



SUCCESS STORY
TimkenSteel
How TimkenSteel used Industry 4.0 ideas to revolutionize procurement, supply chains and inventory management.



SUCCESS STORY
Novozymes Hackathon
How Novozymes harnessed collaboration to spread analytic thinking across an organization.



CUSTOMER STORY
HP Hood
Moving toward widespread statistical enablement, Hood accelerated R&D and deepened product knowledge.





... without coding

Benefits of a no-code solution:

- Time: No need for teaching the software or solving technical difficulties
- Mindset: Focus on [statistical thinking](#) rather than technical implementation
 - Data- and problem-driven rather than syntax- or command-driven
- Ease-of-use: Broader access to powerful analytics
 - Democratization of applied statistics

...but it is not code-less:

- Formula Editor & Full IDE for scripting in [JSL = JMP Scripting Language](#)
 - All analyses can be saved in JSL (created by JMP)
- Model scoring code can be exported in C, Python, SQL, SAS, JavaScript
- Optional integration using Python*, R, MATLAB, SAS, etc. (*embedded)

GAISE recommendations and JMP

Guidelines for Assessment and Instruction in Statistics Education (American Statistical Association 2005), including recommendations for introductory statistics courses on college and pre-K-12 levels in the US. Updated in 2016.

1. Teach statistical thinking
 - Teach statistics as an investigative process of problem-solving and decision-making
 - Give students experience with multivariable thinking
2. Focus on conceptual understanding
3. Integrate real data with a context and purpose
4. Foster active learning
5. Use technology to explore concepts and analyze data
6. Use assessments to improve and evaluate student learning



*) GAISE College Report ASA Revision Committee (2016): "Guidelines for Assessment and Instruction in Statistics Education College Report 2016" available at <http://www.amstat.org/education/gaise>.



Thank you!

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Please get in touch for a personal demo or discussion.



Recommended White Paper

The Integration of Big Data Analytics into a More Holistic Approach

By Roger W. Hoerl



The advent of new analytical methods like neural networks and bootstrapped forests has unlocked a range of exciting new possibilities when it comes to large data sets. Implementing these advanced methods, however, is not always as easy as it would seem. And that's where JMP can help.

In this whitepaper, statistician [Roger W. Hoerl](#) argues that JMP and JMP Pro provide workflows that help users avoid big data mishaps by getting back to the fundamentals of data quality. Beginning with an outline of several more commonly used methods, Hoerl then makes a case for integrating data quality checks in the analytical process. To assist with this synthesis, he identifies the core elements of a data pedigree and outlines a step-by-step holistic approach that applies traditional quality concepts to modern big data applications.

