Technology Companion

Doing Statistics in jamovi

A hands-on companion to

You're Smarter Than You Think: Statistics

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Keyed chapter-by-chapter to the main book

"The computer does the arithmetic. Your job is to ask the right question and read the answer. You can absolutely do that."

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Before You Click a Single Thing

If "statistics software" sounds like something that will crash, cost money, or expect you to know code, breathe. jamovi is none of those. It is free. There is no coding. You point, you click, and the results appear in a panel on the right. When you change something, the results update by themselves, live, so you can watch a number move as you tinker. And nothing you do breaks anything. If a result looks wrong, you uncheck a box and it is gone. That is the whole risk.

This companion follows the main book chapter for chapter. When you finish Chapter 4 in the book, open Chapter 4 here and watch the same ideas happen in jamovi. You never have to guess which menu goes with which idea.

One promise: every click-path in this book is short, and every one is followed by what the result looks like and what it means. You are never left staring at a panel wondering what you are seeing.

Getting jamovi

jamovi is free, forever, from `jamovi.org`. You have two easy choices:

1. **Download it** (Windows or Mac) and install it with the defaults. This is the version most people use.
2. **Run it in your browser** with the "cloud" option on the same site. Nothing to install. Good for a quick look or a locked-down school laptop.

Either way, when jamovi opens you will see two tabs at the very top. Those two tabs are your whole world:

- **The Data tab:** the spreadsheet. This is where your numbers live, and where you tell jamovi which columns are words and which are numbers.
- **The Analyses tab:** the ribbon of buttons (Exploration, T-Tests, ANOVA, Regression, Frequencies). This is where you ask your questions. Results appear in the results panel on the right.

That is it. A place for the data, a place for the questions. Everything in this book happens on one of those two tabs.

Getting Data Into jamovi

Every example in this book comes as a `.csv` file (a plain spreadsheet). Opening one takes three clicks.

Open a file

Click the **hamburger menu** (the three stacked lines in the top-left corner). Then:

jamovi (click this path)

```
Hamburger menu > Open > This PC > pick the .csv file
```

The data fills the spreadsheet on the Data tab. That is the file loaded.

Then set your Measure Types. This is the one habit that makes everything else work. On the Data tab, **double-click a column header**. A small setup panel opens where you name the column and choose its **Measure Type**:

- **Nominal** or **Ordinal** for categories (words), like Home / Library / Cafe.
- **Continuous** for measurements (numbers), like a quiz score.

That is the "words vs. numbers" choice from Chapter 1, made official. jamovi uses it to decide which graphs and tests it will even offer you. Set it once per column and forget it. Now let's walk the book.

Chapter 1

What's the Story in the Data?

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Get data into jamovi, tell it which variables are *words* (categories) and which are *numbers*, and look at your table without panic.

In Chapter 1 you learned the difference between a population and a sample, and between categorical and quantitative variables. In jamovi, that difference is a real setting you turn on, and it decides what jamovi will let you do later.

jamovi (click this path)

```
Hamburger menu > Open > This PC > class.csv
Data tab > double-click "study_spot" > Measure Type: Nominal
Data tab > double-click "quiz_score" > Measure Type: Continuous
```

What you'll see

```
study_spot   Nominal      (a category: Home / Library / Cafe)
quiz_score   Continuous   (a number jamovi can average)
```

▪ READ THE OUTPUT

Setting `study_spot` to **Nominal** tells jamovi these are categories, not text to average. Setting `quiz_score` to **Continuous** tells jamovi these are numbers it can add up and average. That is exactly the "words vs. numbers" choice from the chapter, made official, and it is why later chapters just work.

▪ YOUR TURN

Add a column called `major` with five majors of your choice. Double-click its header and set the Measure Type to Nominal. How does the little icon next to the name change?

Chapter 2

Where Did This Data Come From?

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Understand what jamovi can and cannot do for sampling, and learn what to check about a sample once you have one.

Chapter 2 is about how good data is collected. The gold standard is the simple random sample: everyone has an equal chance. Here is an honest word: **jamovi does not draw random samples for you.** jamovi is an analysis tool, not a sampling machine. Drawing the sample is a study-design step that happens before jamovi, out in the world (a random-number list, a lottery, a survey tool).

What jamovi *is* great at is checking a sample once you have it. Open the file, then look at it with Descriptives to make sure it looks reasonable and is not obviously lopsided.

jamovi (click this path)

```
Hamburger menu > Open > This PC > population40.csv
Analyses > Exploration > Descriptives  (drag "gpa" in)
```

What you'll see

```
N        40
Mean     (a sensible center for the gpas)
Minimum / Maximum   (nothing wildly out of range)
```

▪ READ THE OUTPUT

jamovi cannot promise your sample was random; only your *method* can do that. What jamovi can do is show you the sample's shape so you can sanity-check it. If you truly want jamovi to draw a sample, the optional **Rj editor** module lets you run a line of R inside jamovi, but that is a bonus, not the point of this chapter.

▪ YOUR TURN

Load `population40.csv` and run Descriptives on gpa. Write one sentence describing the sample: its size, its center, and whether anything looks out of place.

Chapter 3

Show Me a Picture

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Make the three core graphs from the chapter: a bar plot for categories and a histogram for numbers (plus a box plot).

jamovi uses your "words vs. numbers" choice to offer the right picture. Bar plots for categories, histograms for numbers. Everything lives under one analysis.

jamovi (click this path)

```
Analyses > Exploration > Descriptives
  drag "study_spot" and "quiz_score" into the Variables box
  open the "Plots" section underneath, then check:
    Bar plot        (for study_spot)
    Histogram       (for quiz_score)
    Box plot        (for quiz_score)
```

What you'll see

```
Bar plot:   Home is the tallest bar (most common study spot)
Histogram:  the bars pile up around 14 to 15
Box plot:   a box over the middle 50% of the scores
```

▪ READ THE OUTPUT

The **Bar plot** draws one bar per category with gaps, and Home is tallest, just like the book. The **Histogram** bins the numbers into touching bars, so you see the scores pile up around 14 to 15. The **Box plot** shows the middle, the spread, and any outliers. Each plot updates live in the results panel; right-click any plot to export it.

▪ YOUR TURN

In the Plots section, look for the histogram's bin setting and change it. Do the bars get chunkier or finer? Does the "pile" still sit near 14 to 15?

Chapter 4

The Typical and the Spread

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Compute the center (mean, median) and the spread (standard deviation, IQR) with a few checkboxes.

Chapter 4's formulas are checkboxes in jamovi. You do not compute them by hand here; you check your by-hand work against jamovi.

jamovi (click this path)

```
Analyses > Exploration > Descriptives  (drag "quiz_score" in)
  open "Statistics" and check:
    Mean    Median    Std. deviation    IQR
```

What you'll see

```
Mean               14.0
Median             14.0
Std. deviation      1.15
IQR                 1.25
```

▪ READ THE OUTPUT

jamovi lays the numbers in a tidy column. Here the mean and median are both 14, which says the scores are fairly symmetric. If the mean were pulled well above the median, that would warn you of a right skew or a high outlier, exactly the reasoning from the chapter. The standard deviation, about 1.15, is the typical distance of a score from that mean.

▪ YOUR TURN

Add one unusually high score, say 40, to the bottom of the `quiz_score` column and watch the Mean and Median update live. Which one moved more? That is why we report the median for skewed data.

Chapter 5

What Are the Chances?

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Build a two-way table, add its totals, and read probabilities and conditional probabilities straight off it.

Chapter 5's two-way tables are where probability gets concrete. jamovi turns counts into row percentages for you.

jamovi (click this path)

```
Analyses > Frequencies > Contingency Tables > Independent Samples
  Rows:    caffeine
  Columns: slept_well
  open "Cells" and check:  Row  (for row percentages)
```

What you'll see

	Slept: Yes	Slept: No	Total
Caffeine Yes	30	20	50
Caffeine No	10	40	50
Total	40	60	100

▪ READ THE OUTPUT

The counts and the **Total** row and column give you the whole picture: 40 of the 100 people slept well overall. Turning on **Row** percentages answers the conditional question: *given* they had caffeine, what fraction slept well? That is conditional probability, the trickiest idea in the chapter, made into a single checkbox.

▪ YOUR TURN

In the Cells section, uncheck Row and check **Column** percentages instead. Now you are conditioning on whether they slept well. In plain words, what question does that table answer?

Chapter 6

Predictable Randomness

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Get exact binomial and normal probabilities without a table in the back of the book.

Chapter 6's distribution tables live in a small add-on called **distrACTION**. You install it once, then it stays in your Analyses ribbon forever.

jamovi (click this path)

```
Modules > jamovi library > distrACTION > Install     (once)

Analyses > distrACTION > Normal Distribution
  Mean 70, SD 8:  Compute Probability  P(X < 80)
                  Compute Quantile     0.90

Analyses > distrACTION > Binomial Distribution
  n 10, p 0.7:    P(X = 8)   and   P(X <= 8)
```

What you'll see

```
Normal   P(X < 80)          = 0.894
Normal   Quantile at 0.90   = 80.25
Binomial P(X = 8)           = 0.233
Binomial P(X <= 8)          = 0.851
```

▪ READ THE OUTPUT

`P(X < 80) = 0.894` says about 89% of scores fall below 80. The quantile runs it backward: to be in the top 10%, you need about 80.25. One box takes a score and gives a probability; the other takes a probability and gives a score. They are opposites. For the binomial, `P(X = 8) = 0.233` is the chance of exactly 8 correct out of 10.

▪ YOUR TURN

In Normal Distribution, find the probability a score is *above* 85. (Hint: ask jamovi for `P(X > 85)`, or take 1 minus `P(X < 85)`.)

Chapter 7

From Sample to Truth

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Understand the Central Limit Theorem through the standard error, which jamovi shows you directly.

Chapter 7 claims something wild: even from a lopsided population, the averages of samples pile up into a bell. Big simulations are easier in R, and the R companion walks you through watching a thousand sample means. jamovi is more limited for simulation, but the concept and the key number are fully visible here.

jamovi (click this path)

```
Analyses > Exploration > Descriptives  (drag "quiz_score" in)
  open "Statistics" and check:  Std. error of Mean
```

What you'll see

```
N                   16
Std. deviation      1.15
Std. error of Mean  0.29    (this is SD / sqrt(N))
```

▪ READ THE OUTPUT

The **standard error** is the standard deviation divided by the square root of the sample size, and jamovi prints it for you: about `1.15 / sqrt(16) = 0.29`. That single number is the beating heart of the chapter. It measures how much a sample mean would bounce around from sample to sample, and those bouncing means pile into a bell. Larger samples make the square root bigger, so the standard error shrinks.

▪ YOUR TURN

The standard error is `SD / sqrt(N)`. Without touching jamovi, predict what happens to it if the sample size grows from 16 to 64. Bigger or smaller? By roughly what factor?

Chapter 8

How Sure Are We?

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Build a confidence interval for a mean and for a proportion, and read it the way the chapter taught.

A confidence interval is a range of believable values for the truth. jamovi hands you the whole interval.

jamovi (click this path)

```
Analyses > T-Tests > One Sample T-Test  (drag "quiz_score" in)
  under "Additional Statistics" check: Confidence interval

Analyses > Frequencies > 2 Outcomes (Binomial test)  ("response")
  the proportion and its confidence interval appear
```

What you'll see

```
Mean 95% CI:          13.4  to  14.6
Proportion (Yes):     0.45
Proportion 95% CI:    0.30  to  0.61
```

▪ READ THE OUTPUT

The mean interval, about `13.4 to 14.6`, says: we are 95% confident the true average score sits in there. The proportion interval, about `0.30 to 0.61`, does the same for the true "yes" rate (18 of 40 said yes, which is 0.45). Want 90% instead of 95%? Change the confidence level in the options and watch the interval shrink.

▪ YOUR TURN

Change the confidence level for the mean from 95% to 99%. Wider or narrower? Why does being *more* confident cost you a *wider* net?

Chapter 9

Testing What We Believe

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Run a one-sample hypothesis test for a mean and for a proportion, and find the p-value.

Chapter 9 is the logic of the p-value. jamovi runs the test and prints the p-value plainly; your job is to decide what it means.

jamovi (click this path)

```
Analyses > T-Tests > One Sample T-Test  (drag "quiz_score" in)
  set "Test value" = 13

Analyses > Frequencies > 2 Outcomes (Binomial test)  ("response")
  set "Test value" = 0.5
```

What you'll see

```
One Sample T-Test
t = 3.46    df = 15    p = 0.003
```

▪ READ THE OUTPUT

Find the p in the output. Here it is 0.003, which is smaller than 0.05, so we reject the claim that the mean is 13; the evidence says the true mean is higher. Same move for the proportion test: set the Test value to 0.5, read the p-value, compare it to your significance level, decide. jamovi never decides for you, and that is the point of the chapter.

▪ CHECK YOUR VOICE

When the results panel fills up, the anxious voice says "I don't know what any of this means." You do. You are looking for one number, the p-value, and asking one question: smaller than 0.05 or not? Everything else is supporting detail.

Chapter 10

Comparing Two Groups

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Compare two group means (independent and paired) and two proportions.

Chapter 10 asks: is the difference between two groups real, or just noise? One menu per situation.

jamovi (click this path)

```
Analyses > T-Tests > Independent Samples T-Test
  Dependent: score    Grouping: group      (two_groups.csv)

Analyses > T-Tests > Paired Samples T-Test
  Paired: before  and  after                (before_after.csv)

Two proportions:
Analyses > Frequencies > Contingency Tables (chi-square)
```

What you'll see

```
Independent Samples T-Test
Group means:  A = 78.2    B = 66.5
t = 2.49    p = 0.036
```

▪ READ THE OUTPUT

The two group means are about 78 and 67, and the p-value 0.036 is below 0.05, so the gap is bigger than noise would easily explain. Choosing **Independent Samples** versus **Paired Samples** is the whole difference between "two separate groups" and "the same people measured twice." That decision is the chapter's key move; in jamovi it is just picking the right menu. For two proportions, the Contingency Tables chi-square is the equivalent test.

▪ YOUR TURN

Which design, independent or paired, matches a weight-loss study that weighs the *same* people in January and June? Which menu would you click for it?

Chapter 11

When Three or More Groups Disagree

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Run a one-way ANOVA and, if it is significant, find *which* groups differ.

When there are three or more groups, you do not run many t-tests. You run one ANOVA. Chapter 11's whole method is one menu in jamovi.

jamovi (click this path)

```
Analyses > ANOVA > One-Way ANOVA
  Dependent Variable: score     Grouping Variable: group
  open "Post-Hoc Tests" and check:  Tukey
```

What you'll see

```
One-Way ANOVA
F = 15.44    p = 0.004
Tukey post-hoc:  compares A vs B, A vs C, B vs C
```

▪ READ THE OUTPUT

Read the p-value: `0.004`, below 0.05, so at least one group's mean really differs. But ANOVA does not say which one. Turning on **Tukey** post-hoc then compares each pair (A vs B, A vs C, B vs C) and flags the real gaps. That two-step logic, "is there a difference, then where," is the heart of the chapter.

▪ YOUR TURN

Look at the Tukey table. Which pair of groups has the smallest p-value? That is the pair that differs the most.

Chapter 12

Counts, Categories, and Surprises

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Run both chi-square tests: goodness-of-fit (one variable) and independence (two variables).

Chapter 12 is about counts that surprise us. Are the categories as evenly split as expected? Are two categorical variables related? Two flavors of one test.

jamovi (click this path)

```
Goodness of fit (is the die fair?):
Analyses > Frequencies > N Outcomes (chi-square goodness of fit)
  Variable: face    Counts: count            (dice60.csv)

Independence (are caffeine and sleep related?):
Analyses > Frequencies > Contingency Tables  (the Chapter 5 table)
```

What you'll see

```
N Outcomes chi-square (goodness of fit)
X-squared = 2.8    df = 5    p = 0.73
```

▪ READ THE OUTPUT

For the die, the p-value 0.73 is large (well above 0.05), so we do *not* have evidence the die is unfair; the ups and downs are ordinary luck. For the caffeine-and-sleep table, a small p-value would say the two variables are related, not independent. Same idea, two questions, exactly as the chapter frames them.

▪ YOUR TURN

Change the die counts to something lopsided, like 2, 3, 4, 20, 6, 25, and re-run. Does the p-value drop below 0.05 now? What would you conclude about that die?

Chapter 13

Drawing the Line

▪ WHAT THIS CHAPTER DOES IN JAMOVI

Measure correlation, fit a regression line, read its slope and R^2, and predict.

The last chapter draws the line through a scatterplot and asks what it means. jamovi gives you the correlation, the line, and the numbers to make a prediction.

jamovi (click this path)

```
Analyses > Regression > Correlation Matrix
  drag in: hours  and  grade                  (study_hours.csv)

Analyses > Regression > Linear Regression
  Dependent Variable: grade     Covariate: hours
  open "Model Fit" for R-squared; "Model Coefficients" for the line
```

What you'll see

```
Correlation r          = 0.9985
Intercept              = 46.47
Slope (hours)          = 5.69
R-squared              = 0.997
```

▪ READ THE OUTPUT

`r = 0.9985` is a very strong positive relationship. The `hours` slope `5.69` means each extra study hour adds about 5.7 points. `R-squared = 0.997` says hours explain about 99.7% of the variation in grade (unusually clean, because this is teaching data). To predict a grade at 3.5 hours, plug into the line: `46.47 + 5.69 times 3.5`, about 66.4 points. Slope, strength, prediction: the whole chapter, on one panel.

▪ CHECK YOUR VOICE

You just fit a regression model, the thing that sounded impossible on day one. Notice that. The clicks got simpler as the ideas got bigger, because the computer carries the arithmetic. You carried the understanding the whole way.

The Datasets, Chapter by Chapter

Every example in this book comes with a ready-made data file, so you can load the real numbers instead of typing them. All nine files live in a folder called `data`, sitting right next to this PDF. They are plain `.csv` files, which means they also open in **StatCrunch**, **R**, Excel, Google Sheets, and (typed into lists) the **TI-84**. One set of data, every tool.

How to load a dataset (do this once per file)

In jamovi, open the file with the hamburger menu, then set your Measure Types on the Data tab:

jamovi (click this path)

```
Hamburger menu > Open > This PC > data/class.csv
Data tab > double-click each column header
  > set Measure Type: Nominal/Ordinal (words) or Continuous (numbers)
```

The data fills the spreadsheet on the Data tab, and your results update live once the Measure Types are set. If a graph or test is greyed out, it is almost always a Measure Type that needs fixing: a number column set to Nominal, or a category set to Continuous.

The nine datasets

File	Chapters	What's inside (columns)
`class.csv`	1, 3, 4, 8, 9	16 students: `student`, `study_spot` (Home/Library/Cafe), `quiz_score`
`population40.csv`	2	40 students to sample from: `student_id`, `gpa`
`caffeine_sleep.csv`	5, 12	100 people: `caffeine` (Yes/No), `slept_well` (Yes/No)
`survey40.csv`	8, 9	40 people: `person`, `response` (Yes/No; 18 said Yes)
`two_groups.csv`	10	Two independent groups: `id`, `group` (A/B), `score`
`before_after.csv`	10	Same people twice: `student`, `before`, `after`
`three_groups.csv`	11	Three groups for ANOVA: `id`, `group` (A/B/C), `score`
`dice60.csv`	12	A die rolled 60 times: `face` (1 to 6), `count`
`study_hours.csv`	13	`hours` studied and the `grade` earned (6 students)

Two chapters need no file. Chapter 6 (Predictable Randomness) uses the **distrACTION** module's built-in normal and binomial calculators, and Chapter 7 (From Sample to Truth) is taught by concept and by the standard error you read off Descriptives. Nothing to download for those two.

Loading each one is the same move. Open with the hamburger menu, then double-click each header to set its Measure Type. For example, to rebuild the Chapter 5 two-way table, open `caffeine_sleep.csv`, set both columns to Nominal, then go to Frequencies > Contingency Tables. To run the Chapter 10 two-group test, open `two_groups.csv`, set `score` to Continuous and `group` to Nominal, then go to T-Tests > Independent Samples T-Test.

Notice the pattern: set the Measure Types right, and the correct analysis is always waiting for you in the ribbon. That is the same file, read the jamovi way.

Quick Reference: The Whole Book in jamovi

One click-path per idea

Idea (chapter)	jamovi
Make categories (1)	Data tab: double-click header, set Measure Type
Random sample (2)	Study-design step; check it with Descriptives
Bar plot / histogram (3)	Exploration > Descriptives > Plots
Center & spread (4)	Exploration > Descriptives > Statistics
Two-way table (5)	Frequencies > Contingency Tables
Normal / binomial (6)	distrACTION > Normal / Binomial
Sampling distribution (7)	Descriptives: Std. error of Mean
Confidence interval (8)	T-Tests > One Sample T-Test (CI)
One-sample test (9)	One Sample T-Test; 2 Outcomes Binomial
Two groups (10)	T-Tests > Independent / Paired Samples
ANOVA (11)	ANOVA > One-Way ANOVA (Tukey)
Chi-square (12)	Frequencies > N Outcomes / Contingency Tables
Regression (13)	Regression > Correlation Matrix / Linear Regression

You did statistics, and you did it by pointing and clicking. That is not a small thing. Keep this page next to you; it is the whole course in thirteen click-paths.