Master Tutorial

TITLE

Big Data Systems with R

SHORTENED TITLE

Big Data Systems with R

ABSTRACT

Beginners to R are often intimidated by the various analytic systems. Three popular systems include base R, data.table, and the tidyverse, each with different syntax. This tutorial session will explain how each system works and the corresponding benefits/drawbacks when analyzing big data. Bring your laptop for this interactive session (download session materials here: <https://bit.ly/32ag86B>).

PRESS PARAGRAPH

R can be intimidating when transitioning from statistical software such as SPSS or SAS. Unlike SPSS or SAS, R often has many ways to approach the same problem. One of the common frustrations with R is that there are many frameworks/systems within R, each with a different rationale and syntax. Three common frameworks include “base R”, “data.table”, and the “tidyverse”. Beginners to R cannot know which system to adopt for a given problem and, worse, how to read and understand code across different systems. This session will act as a Rosetta stone, showing new R users how to read code across the various frameworks and which one might be the most appropriate for a given problem, especially when analyzing big data where the differences between the systems are magnified.

WORD COUNT: 2167

**Big Data Systems with R**

**Presenter Information**

Jeff Jones

Director, Talent Analytics and Data Systems

Korn Ferry

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Membership Status: Member

Steven Nydick

Data Scientist Programmer

Korn Ferry

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**Presenter Bios**

Jeff Jones is the Director of Talent Analytics and Data Systems at Korn Ferry where he oversees the organization’s production scoring services, designs scoring algorithms, and is a subject matter expert for psychometrics and statistical methodology. He has published articles in theoretical and methodological journals such as *Psychometrika* and *Psychological Methods*, and is a coauthor on several CRAN and internal R packages. Jeff received his Ph.D. at the University of Minnesota in Psychometrics and Quantitative Psychology where he focused on creating new statistical methodology, asymptotic statistics, and higher-order geometry of statistical methodology.

Steven Nydick is a Data Scientist Developer at the Korn Ferry Institute, where he designs R-based tools and scoring algorithms. He is the lead author and maintainer of the catIrt R package as well as several internal R packages helping with everything from plotting to powerpoint generation to interfacing with servers. He has contributed to developing psychometric models and corresponding estimation algorithms that have been published in *Applied Psychological Methods* and the *Journal of Educational and Behavioral Statistics*. Steven received his Ph.D at the University of Minnesota in Psychometrics and Quantitative Psychology, where he primarily studied IRT-based adaptive tests for selection and classification. He also has an M.S. in Statistics from the University of Minnesota.

Ben Wiseman is a Data Science Developer at the Korn Ferry Institute responsible for maintaining and developing R-based automation tools, models, reports, and user interfaces. He has publications in entomology, ecology, and molecular evolution and has worked with and trained numerous clients in the military, public, and private sectors on a wide range of applications. Ben received his MSc from Lincoln University (New Zealand) in applied statistical modelling where he developed a user-facing geospatial AI platform for DOCs predator monitoring and control systems.

**References**

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Bouchet-Valat, M. (2019). SnowballC: Snowball stemmers based on the C ‘libstemmer’ UTF-8 library. R package version 0.6.0.

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Dowle, M., & Srinivasan, A. (2019). data.table: Extension of `data.frame`. R package version 1.12.2.

Feinerer, I., & Hornik, K. (2018). Tm: Text mining package. R package version 0.7-6.

Feinerer, I., & Hornik, K. (2015). RKEY: R/KEA interface. R package version 0.0-6.

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Feuerriegel, S., & Proellochs, N. (2019). SentimentAnalysis: Dictionary-based sentiment analysis. R package version 1.3-3.

Goebl, A. P., Jones, J. A., & Semmel, S. G. (2016, April). Handling big(gish) data in R:

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Jockers, M. L. (2015). Syuzhet: Extract sentiment and plot arcs from text. R package version 1.0.4.

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019a, April). Effective data wrangling and visualization with R. Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, National Harbor, MD.

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019b, April). Web scraping with R. Master Tutorial at the annual meeting of the Society of the Industrial and Organizational Psychology, National Harbor, MD.

Jurafsky, D. (n.d.). Sentiment analysis: What is sentiment analysis. Retrieved August 14, 2019, from <https://web.stanford.edu/class/cs124/lec/sentiment.pdf>

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Schwall, A., Lustenberger, D., Beatty, A., & Jones, J. A. (2014, May). *Getting started*

*with R: Examples and Lessons Learned.* Panel discussion at the annual meeting

of the Society of Industrial and Organizational Psychology, Honolulu, HI.

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Silge, J., & Robinson, D. (2017). *Text Mining with R: A Tidy Approach*. Sebastopol, CA: O’Reilly Media,

Inc. Retrieved August 13, 2019, from https://www.tidytextmining.com/.

Wickham, H. (2016). *ggplot2: Elegant Graphics for Data Analysis*. New York, NY: Springer.

Wickham, H., François, R., Henry, L., & Müller, K. (2018). dplyr: A grammar of data manipulation. R

package version 0.8.3.

Wild, F. (2015). Lsa: Latent semantic analysis. R package version 0.73.1.

**Appendix**

CV Jeff Jones

CV Steven Nydick

CV Benjamin Wiseman

Jeff Jones

Email: [Jeff.Jones@KornFerry.com](mailto:Jeff.Jones@KornFerry.com)

**Education:**

Doctorate in Quantitative Psychology and Psychometrics, University of Minnesota, October, 2013. Advisor: Dr. Niels Waller.

Bachelor of Science, Psychology, University of California, Davis, June 2006.

Bachelor of Arts, Japanese Language and Literature, University of California, Davis, June 2006.

Minor in Mathematics, University of California, Davis, June 2006.

**Employment History:**

Director, Talent Analytics and Data Systems, Korn Ferry, 2017 – Present.

Adjunct Professor, University of Minnesota, 2017 – Present.

Senior Manager of Analytics, Korn Ferry, 2015 – 2017.

Manager of Research and Analytics, Korn Ferry, 2013 – 2015.

Adjunct Professor, Hamline University, Fall 2013.

Graduate Instructor/Section Leader, University of Minnesota, 2006 – 2013.

**Awards:**

Korn Ferry Founder’s Award for Innovation, 2015.

Eva O. Miller Fellowship, 2012.

Graduate Summer Research Fellowship, 2009.

Graduate Research Partnership Program Fellowship, 2007.

**Publications:**

Jones, J. A. & Waller, N. G. (2016). Fungible weights in logistic regression. *Psychological Methods, 21,*

241-260*.*

Jones, J. A. & Waller, N. G. (2015). The normal-theory and asymptotic distribution-free covariance matrix of standardized regression coefficients: Theoretical extensions and finite sample behavior. *Psychometrika, 80,* 365-378.

Jones, J. A. & Waller, N. G. (2013). Computing confidence intervals for standardized regression coefficients. *Psychological Methods, 18,* 435-453.

Jones, J. A. & Waller, N. G. (2013). Abstract: The normal-theory and asymptotic distribution-free covariance matrix of standardized regression coefficients. *Multivariate Behavioral Research, 48,* 161.

Waller, N. G. & Jones, J. A. (2011). Investigating the performance of alternate regression weights by studying all possible criteria in regression models with a fixed set of predictors. *Psychometrika, 76,* 410-439.

Jones, J. A. (2010). GenCorr: An R routine to generate correlation matrices from a user-defined eigenvalue structure. *Applied Psychological Measurement, 34,* 68-69.

Waller, N. G. & Jones, J. A. (2010). Correlation weights in multiple regression.  *Psychometrika, 75,* 58-69.

Waller, N. G. & Jones, J. A. (2009). Locating the extrema of fungible regression weights. *Psychometrika,*

*74,* 589-602.

**Software:**

Wiseman, B., Nydick, S. W., & Jones, J. A. (2018). roperators: Additional operators to

help you write cleaner R code. R package version 1.0.1.

<https://CRAN.R-project.org/package=roperators>

Goebl, A. P., Jones, J. A., Dahlke, J., & Beatty, A. S. (2016). iopsych: Methods for

industrial/organizational psychology. R package version 0.90.

Waller, N. G. & Jones, J. A. (2015). fungible: Fungible coefficients and Monte Carlo

functions. R package version 1.3.

**Presentations and Workshops:**

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). *Web scraping with R.* Master Tutorial at the

annual meeting of the Society of the Industrial and Organizational Psychology, National Harbor, MD.

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). *Effective data wrangling and visualization with R.*

Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, National Harbor, MD.

Goebl, A. P., Jones, J. A., & Semmel, S. G. (2018, April). *Machine learning in R: A*

*tutorial and jam session.* Master Tutorial at the annual meeting of the Society of

Industrial and Organizational Psychology, Chicago, IL.

Thompson, I. B., Song, Q. C., Goebl, A. P., Hall, S., Meade, A. W., Newman, D. A.,

Wee, S., & Jones, J. A. (2018, April). *Machine learning techniques for multiple*

*criteria optimization.* Alternative Session at the annual meeting of the Society of

Industrial and Organizational Psychology, Chicago, IL.

Wendt, H., Goff, M., Jones, J. A., & Hezlett, S. A. (2017, May). *Examining relationships*

*between the Korn Ferry personality inventory and job engagement across*

*countries.* In S. Dilchert and D. Ones (Chairs), *An IRT based approach to*

*personality measurement: Some cross cultural examinations.* Paper presented at

the annual meeting of the European Association of Work and Organizational

Psychology, Dublin, Ireland.

Hezlett, S. A., Jones, J. A., Lewis, J., Goff, M., & Stirling, E. (2017, April). *What*

*motivates may alienate: Linking motivational factors to derailment risks.* In S.

Hezlett (Chair), *Maladaptation: Building the nomological net of derailing traits and behaviors.* Paper presented at the annual meeting of the Society of Industrial and Organizational Psychology, Orlando, FL.

Jones, J. A., Goebl, A. P., & Semmel, S. G. (2017, April). *Modern methods for I-O*

*psychologists: An interactive tutorial in R.* Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, Orlando, FL.

Schwall, A., Beatty, A., & Jones, J. A. (2017, April). *Data visualization with R.* Master

Tutorial at the annual meeting of the Society of Industrial and Organizational

Psychology, Orlando, FL.

Semmel, S. G., Jones, J. A., & Goebl, A. P. (2017, April). *What is machine learning?*

*Foundations and introductions to useful methods.* Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, Orlando, FL.

Jones, J. A., Goebl, A. P., & Semmel, S. G. (2016, April). *Handling big(gish) data in R:*

*An introductory and interactive tutorial.* Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, Anaheim, CA.

Goebl, A. P. & Jones, J. A. (2016, April). *An R package for I-O psychology simulation*

*building: iopsych.* Poster presented at the annual meeting of the Society of

Industrial and Organizational Psychology, Anaheim, CA.

Goebl, A. P. & Jones, J. A. (2016, April). *Creative performance is a viable criterion for*

*personnel selection.* Poster presented at the annual meeting of the Society of

Industrial and Organizational Psychology, Anaheim, CA.

Blazek, S. & Jones, J. A. (2016, April). *A year on the job: Simulations-based*

*assessments’ versatile utility.* In D. Guangrong (Chair), *The art and science of executive assessment: Research and practice.* Paper presented at the annual meeting of the Society of Industrial and Organizational Psychology, Anaheim, CA.

Blazek, S. & Jones, J. A. (2016, February). Streamlining your voice of the customer

program: Automating survey follow-ups, panel updates, and reports. Presentation given at Qualtrics Insight Summit, Salt Lake City, UT.

Jones, J. A. & Beatty, A. (2015, December). *R Workshop*. Workshop given at the

monthly meeting of Minnesota Professionals for Psychology Applied to Work, Minneapolis, MN.

Schwall, A., Beatty, A., & Jones, J. A. (2015, May). *Getting started with R: An*

*Interactive and Hands on Tutorial.* Master Tutorial at the annual meeting of the

Society of Industrial and Organizational Psychology, Philadelphia, PA.

D’Mello, S. & Jones J. A. (2015, May). *Demographic Differences in the Motivational*

*Drivers of Leaders*. Poster presented at the annual meeting of the Society of

Industrial and Organizational Psychology, Philadelphia, PA.

Goebl, A., Jones J. A., & Sharpe, E. (2015, May). *Relative Criteria Importance Depends*

*on Predictor Choices*. Poster presented at the annual meeting of the Society of

Industrial and Organizational Psychology, Philadelphia, PA.

Schwall, A., Lustenberger, D., Beatty, A., & Jones, J. A. (2014, May). *Getting started*

*with R: Examples and Lessons Learned.* Panel discussion at the annual meeting

of the Society of Industrial and Organizational Psychology, Honolulu, HI.

Huber, C. & Jones, J. A. (2014, May). *Principal components and factor scores in*

*multiple regression: A simulation.* Poster presented at the annual meeting of the

Society of Industrial and Organizational Psychology, Honolulu, HI.

Jones, J. A. & Waller, N. G. (2012). *The normal-theory and asymptotic distribution-free covariance matrix of standardized regression coefficients.* Annual Meeting, Society for Multivariate Experimental Psychology Conference, Vancouver, British Columbia.

Morris P. E. & Jones, J. A. (2005). *Using formal inference-based recursive*

*modeling to detect plausible interactions for multiple regression.* Annual Meeting, American Psychological Society Conference, Los Angeles, CA.

**Technical Reports and White Papers:**

Blazek, E. S., Jones, J. A., Lewis, J. L, & Orr, J. E. (2018). Develop and select the best

CEOs. Korn Ferry Institute, Korn Ferry.

Blazek, E. S., Jones, J. A., Lewis, J. L, & Orr, J. E. (2017). CEO staying power. Korn

Ferry Institute, Korn Ferry.

Lewis, J., Goff, M., Hezlett S., Jones, J. A., Li, T., Dai, G., & Deege, A. (2017). Korn

Ferry four dimensional enterprise assessment: Research guide and technical

manual. Version 17.1a—11/2017, Korn Ferry.

<http://www.kornferry.com/technical-manuals>

Blazek, E. S., Jones, J. A., Lewis, J. L, & Orr, J. E. (2016). Predicting financial gains.

Korn Ferry Institute, Korn Ferry.

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Ferry Institute, Korn Ferry.

Blazek, E. S., Jones, J. A., Lewis, J. L, & Orr, J. E. (2016). Korn Ferry simulations-based

assessments predict CEO success: CEO outcomes research technical paper. Korn

Ferry Institute, Korn Ferry.

Dai, G., Davies, S., Goff, M., Jones J. A., D’Mello, S., Orr, J. E., Storfer, P., & Tang, K.

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(ADF) covariance matrix of standardized regression coefficients: Theoretical

extensions and finite sample behavior. Technical Report 052513. University of

Minnesota, Twin Cities.

http://www.psych.umn.edu/faculty/waller/downloads/techreports/TR052913.pdf

Lewis, J. & Jones, J. A. (2016). Fit matters. Korn Ferry Institute, Korn Ferry.

<http://www.kornferry.com/institute/fit-matters>

Lewis, J., Goff, M., Jones, J. A., Hezlett S., Tang, K. Y., Dai, G., D’mello, S., Henry, L.,

Zes, D., Fetzer, J., Xie, C., & Scheer, P. (2015). Korn Ferry four dimensional executive assessment: Research guide and technical manual. Version 15.1a—01/2016, Korn Ferry. <http://www.kornferry.com/technical-manuals>

**Courses Taught:**

Introduction to Data Analysis/Statistics for Undergraduates

Analysis of Psychological Data for Graduate Students

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**Education:**

PhD, University of Minnesota, Psychometrics/Quantitative Psychology, 2013.

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Advisor: Niels Waller

MS, University of Minnesota, Statistics, 2011.

Advisor: Sanford Weisberg

BS, Syracuse University, Mathematics and Psychology, 2006.

**Professional Experience:**

Data Scientist Developer, Korn Ferry, 2018 – Present.

Senior Psychometrician, Pearson VUE, 2016 – 2018.

Psychometrician, Pearson VUE, 2013 – 2016.

Research Assistant, University of Minnesota, 2013 – Present.

Intern in Psychometrics, ARRT, 2012 – 2013.

Intern in Psychometrics, ACT, 2011.

Graduate Instructor/Section Leader, University of Minnesota, 2007 – 2013.

**Awards:**

Doctoral Dissertation Fellowship, 2013

Graduate Research Partnership Program, 2010

Archimedes Prize in Mathematics, 2006

**Manuscripts Published and In Press:**

Wang, C. & Nydick, S. W. (2015). Comparing two algorithms for calibrating the restricted non-

compensatory multidimensional IRT model. *Applied Psychological Measurement*, *39*, 119-134.

Nydick, S. W. (2014). The sequential probability ratio test and binary item response models. *Journal of*

*Educational and Behavioral Statistics*, *39*, 203-230.

**Software:**

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help you write cleaner R code. R package version 1.0.1.

<https://CRAN.R-project.org/package=roperators>

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0.5-0).

**Presentations and Workshops:**

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). Web scraping with R. Master Tutorial at the

annual meeting of the Society of the Industrial and Organizational Psychology, National Harbor, MD.

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). Effective data wrangling and visualization with R.

Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, National Harbor, MD.

Nydick, S. W. (2016, April). The expected likelihood in computerized classification testing. Paper

presented at the annual meeting of the National Council on Measurement in Education, Washington, DC.

Nydick, S. W. (2014, April). Multidimensional mastery testing with CAT. Paper presented at the annual

meeting of the National Council on Measurement in Education, Philadelphia, PA.

Nydick, S. W., Wang, C., & Xiong, X. (2014, April). Measuring multidimensional growth—a higher-order

IRT perspective. Paper presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.

Nydick, S. W., Nozawa, Y., & Zhu, R. (2012, April). Accuracy and efficiency in classifying examinees using

computerized adaptive tests: An application to a large scale test. Paper presented at the Annual Meeting of the National Council on Measurement in Education, Vancouver, BC.

Nydick, S. W., & Weiss, D. J. (2010, June). Accepting the null: No change in change CAT. Paper presented

at the IACAT conference on CAT, Arnhem, NL.

Nydick, S. W., & Weiss, D. J. (2009). A hybrid simulation procedure, evaluated for the development of

CATs. In D. J. Weiss (Ed.) *Proceedings of the 2009 GMAC Conference on Computerized Adaptive Testing.*

**Unpublished Manuscripts:**

Nydick, S. W. (2013). *Intro to R for Psychologists.* Minneapolis, MN: Author.

**Courses Taught:**

Introduction to Data Analysis/Statistics for Undergraduates

Honors Introduction to Data Analysis/Statistics for Undergraduates

Analysis of Psychological Data for Graduate Students

Benjamin Wiseman

Email: Benjamin.Wiseman@KornFerry.com

**Education:**

MS, Lincoln University, Applied Statistics, 2015.

BS, Lincoln University, Biostatistics, 2013.

**Professional Experience:**

Data Scientist Developer, Korn Ferry, 2018 – Present.

Owner, Wiseman Analytics, 2016 – 2018.

Information Services, DHS, 2015 – 2016.

Instructor, Lincoln University, 2013 – 2014.

Research Assistant, Lincoln University, 2011 – 2015.

Research Assistant, Seoul National University, 2011.

**Awards:**

Freemasons university scholarship

Forest and Bird research award

AGLS research scholarship

**Manuscripts Published and In Press:**

Wiseman, BH., Fountain, ED., Bowie, MH. He, S., Cruickshank, RH. 2016. Vivid molecular divergence over volcanic remnants: the phylogeography of Megadromus guerinii on Banks Peninsula, New Zealand. New Zealand Journal of Zoology

Fountain, ED., Pugh, AR., Wiseman, BH., Smith, VR., Cruickshank, RH., and Paterson, AM. 2015. On the captive rearing of Hadramphus tuberculatus (Pascoe 1877) (Coleoptera: Curculionidae: Molytinae):is ex-situ conservation the lesser of two weevils? New Zealand Entomologist.

Gillespie, M., Cruickshank, RH., Wiseman, BH., Wratten, S. 2013. Incongruence between morphological and molecular markers in the butterfly genus Zizina (Lepidoptera: Lycaenidae) in New Zealand.Systematic Entomology 38:151-163.

Fountain, ED., Wiseman, BH., Cruickshank, RH., and Paterson, AM. 2013. The ecology and conservation of Hadramphus tuberculatus (Pascoe 1877) (Coleoptera: Curculionidae: Molytinae). Journal of Insect Conservation 17:737-745.

**Software:**

Wiseman, B. W., Nydick, S.W., Jones, J (2018) roperators: Additional Operators to Help you Write Cleaner R Code. R package version 1.0-1).

Wiseman, B. W. (2015) Neurofriendly: Artificial Neural Networks Made Simple

Wiseman, B. W. (2015) Geofriendly: Easy Spatial Application of Artificial Neural Networks

**Presentations and Workshops:**

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). Web scraping with R. Master Tutorial at the

annual meeting of the Society of the Industrial and Organizational Psychology, National Harbor, MD.

Jones, J. A., Nydick, S. W., & Wiseman, B. (2019, April). Effective data wrangling and visualization with R.

Master Tutorial at the annual meeting of the Society of Industrial and Organizational Psychology, National Harbor, MD.

Wiseman, B. H. 2017 Data Science with Python. ESRI Developer Summit, Palm Springs, CA.

Wiseman, B. H. 2013 Messy data, messy models and applied statistics. Presented for Bio-Protection seminar, Lincoln University, New Zealand.

Marris, J. and Wiseman, B. H. 2012. Islands in the snow: Ecology, systematics and biogeography of the New Zealand beetle genus Protodendrophagus (Coleoptera:Silvanidae:Brotini). Presented at the New Zealand Ecological Society conference.

Cripps, M., McNeil, M., Patrick, H., Wiseman, B., Nobilly, F., Edwards, G. 2012. Invertebrate abundance and diversity in intensively managed dairy pastures.New Zealand Plant Protection Society Conference.

Wiseman, B. H., Cruickshank, R. H., Bowie, M. H., Fountain, E. D. 2011. Unexpected genetic variation in an endemic ground beetle: The molecular mystery of Megadromus guerinii (Coleoptera: Carabidae). 3rdAnnual Combined Australian and New Zealand Entomological Societies Conference

Wiseman, B. H. (2011). The curious case of Megadromus guerinii: phylogeographic oddities on Bank’s Peninsula. Presented to the Canterbury branch of the New Zealand Entomological Society.

**Courses Taught:**

Research and Analytical Skills

Geospatial Information Systems with Arc GIS

Business Statistics

Intermediate Statistics for Commerce