



COLLABORATE18

TECHNOLOGY AND APPLICATIONS FORUM
FOR THE ORACLE COMMUNITY

Future Proof Your Career:

What Every Executive Needs to Know about Adaptive Intelligence

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Session ID:

10401

Prepared by:

Tim Vlamis

VP & Analytics Strategist

Vlamis Software Solutions

Sunday April 22, 2018

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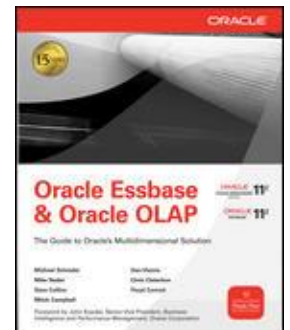
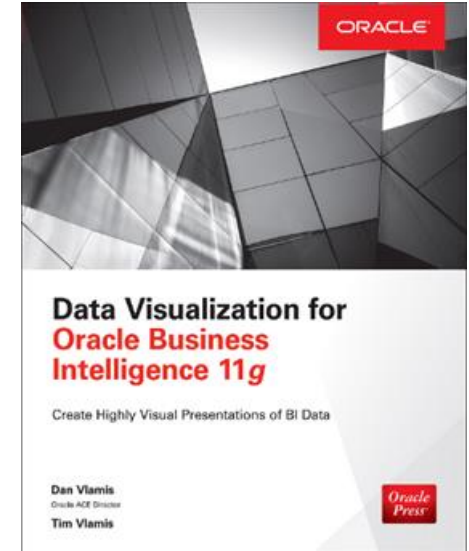
VlamiS Software Solutions

- VlamiS Software founded in 1992 in Kansas City, Missouri
- Developed 200+ Oracle BI and analytics systems
- Specializes in Oracle-based:
 - Enterprise Business Intelligence & Analytics
 - Analytic Warehousing
 - Data Mining and Predictive Analytics
 - Data Visualization
- Multiple Oracle ACEs, consultants average 15+ years
- www.vlamiS.com (blog, papers, newsletters, services)
- Creators of the [Force Directed Graph Plugin](#) on the [Oracle Analytics Library](#)
- Co-authors of book “Data Visualization for OBI 11g”
- Co-author of book “Oracle Essbase & Oracle OLAP”
- Oracle University Partner
- Oracle Gold Partner

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Specialized
Oracle Business Intelligence
Foundation Suite 11g



Tim Vlamis

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Vice President & Analytics Strategist

- 30+ years in business modeling and valuation, forecasting, and scenario analyses
- Oracle ACE  
- Instructor for Oracle University's Predictive Analytics, Data Mining Techniques, and Oracle R Enterprise Essentials Courses
- Professional Certified Marketer (PCM) from AMA
- MBA Kellogg School of Management (Northwestern University)
- BA Economics Yale University

Vlamis Presentations

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Presenter	Location	Time	Title
Cathye Pendley	Banyan D	Sunday 12:30pm	Do the Mashup: How to Get BI Self Service Data Connections Right
Tim Vlamis	South Pacific J	Sunday 3:00pm	Future Proof Your Career: What Every Executive Needs to Know About Adaptive Intelligence
Arthur Dayton & Tim Vlamis	Banyan A	Monday 11:00am	Introduction to Machine Learning in Oracle Analytics Cloud
Dan Vlamis Tim Vlamis	Banyan B	Monday 4:15pm	Getting from Answers/Dashboards to Data Visualization
Arthur Dayton Dan Vlamis	Banyan E	Wednesday 11:00am	Using Node.js to Make OBIEE the Application You Always Wanted It to Be

Presentation Agenda

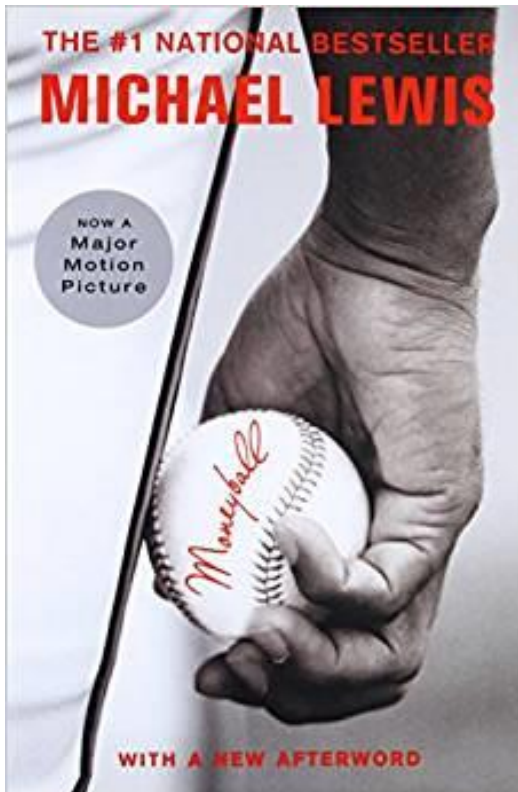
- A little language and background
- Machine Learning Systems
- Basics of Bayesian Thinking
- Sources for learning more
- **YOUR QUESTIONS AT ALL TIMES!**

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Moneyball

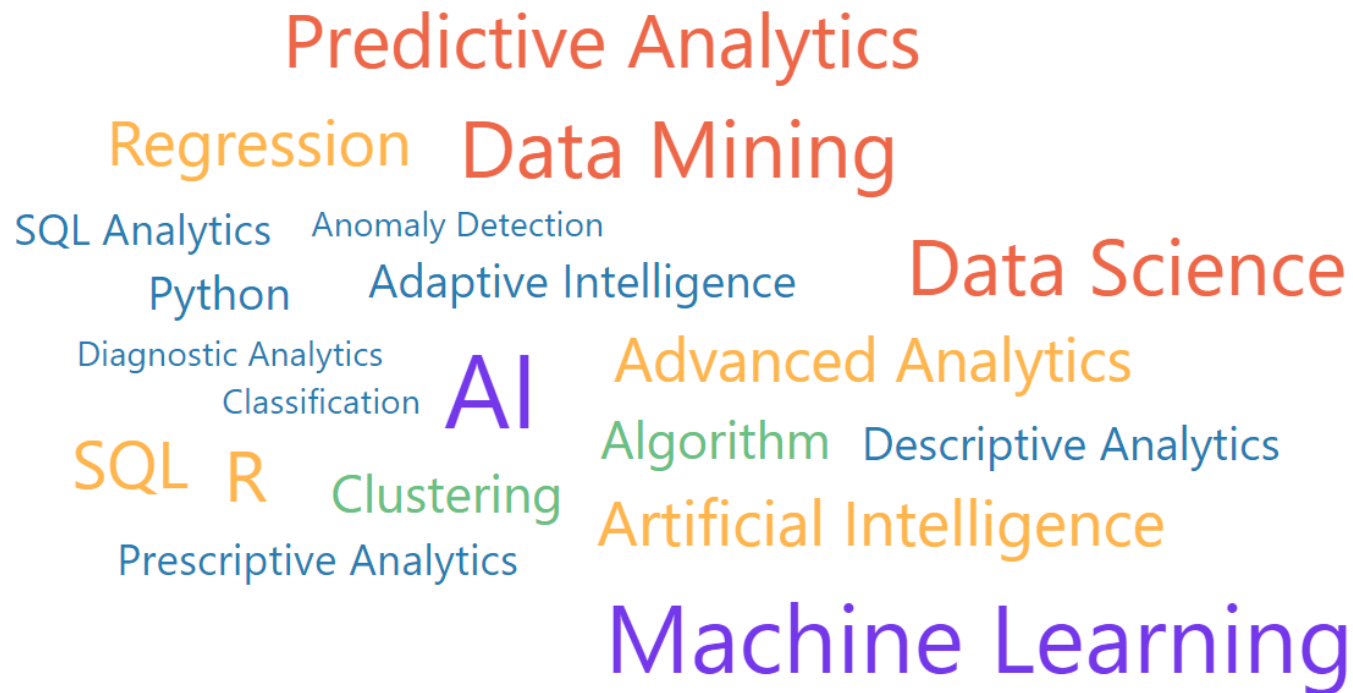
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- “One absolutely cannot tell, by watching, the difference between a .300 hitter and a .275 hitter. The difference is one hit every two weeks.”
— [Michael Lewis](#), [Moneyball](#)



Many Words, Closely Related

- Adaptive Intelligence → like machine learning with broader inputs
- Machine Learning → like data mining with auto-updated predictions
- Data Mining → like statistics and algorithmic processing
- Predictive Analytics → like data mining and machine learning



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What is Machine Learning?

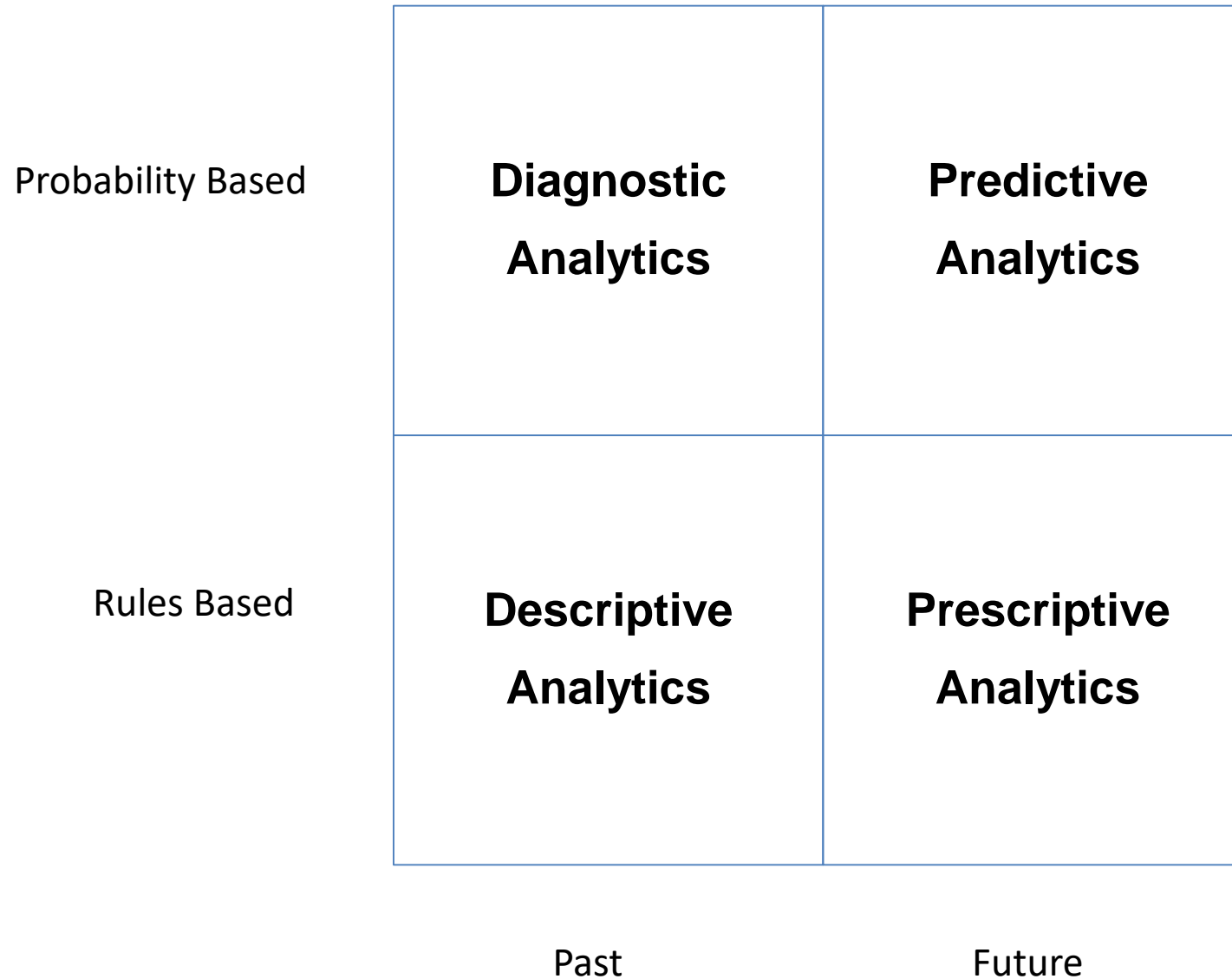
- Automatically sifts through data to find hidden patterns, discover new insights, and make predictions
- Predictions are updated with new information from the system
- Machine Learning algorithms can provide valuable results:
 - Predict customer behavior (*Classification*)
 - Predict or estimate a value (*Regression*)
 - Segment a population (*Clustering*)
 - Identify factors more associated with a business problem (*Attribute Importance*)
 - Find profiles of targeted people or items (*Decision Trees*)
 - Determine co-occurrences and “market baskets” within an event set (*Associations*)
 - Find fraudulent or “rare events” (*Anomaly Detection*)

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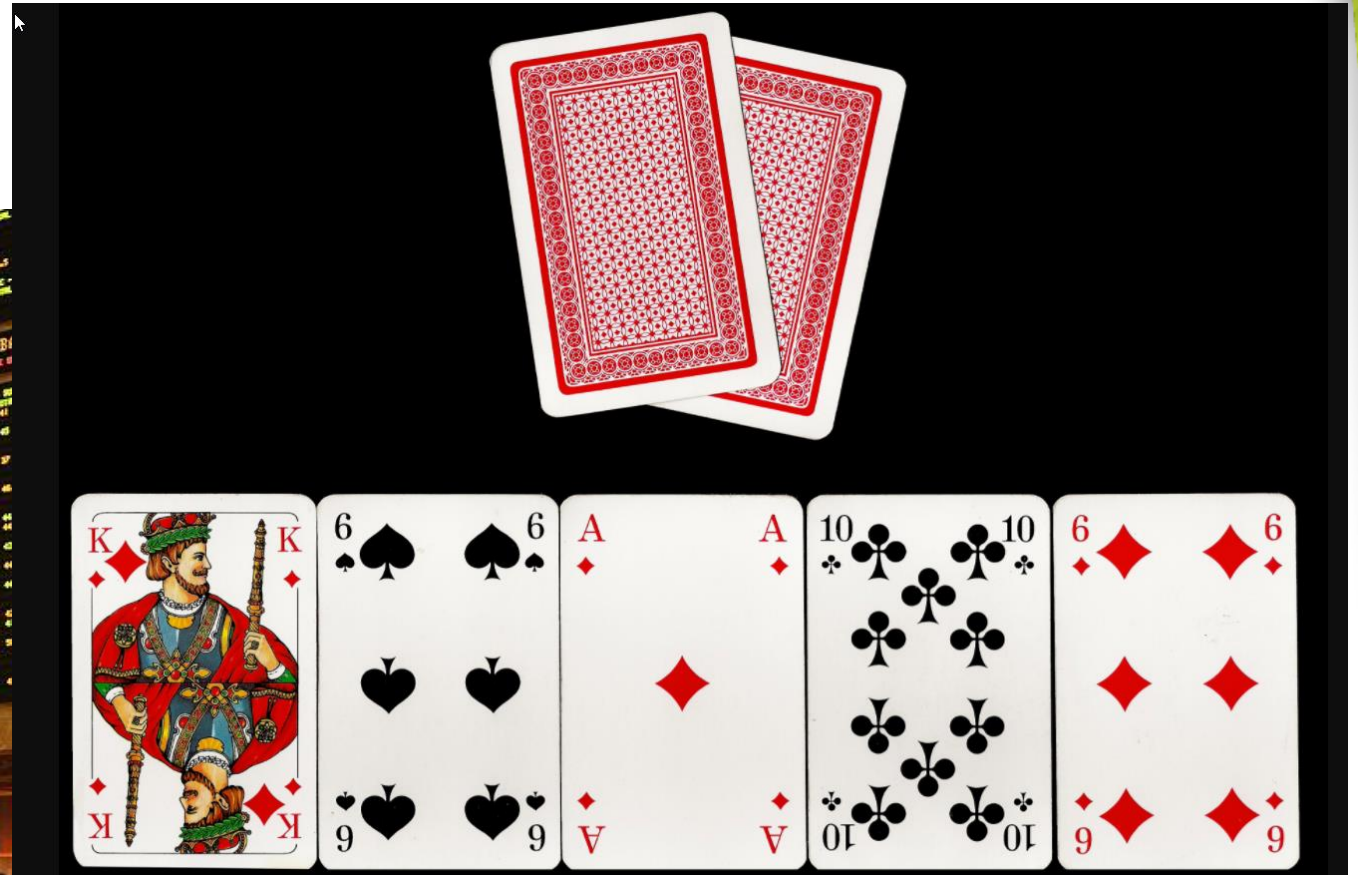
Four Realms of Analytics



Probabilities, not Outcomes

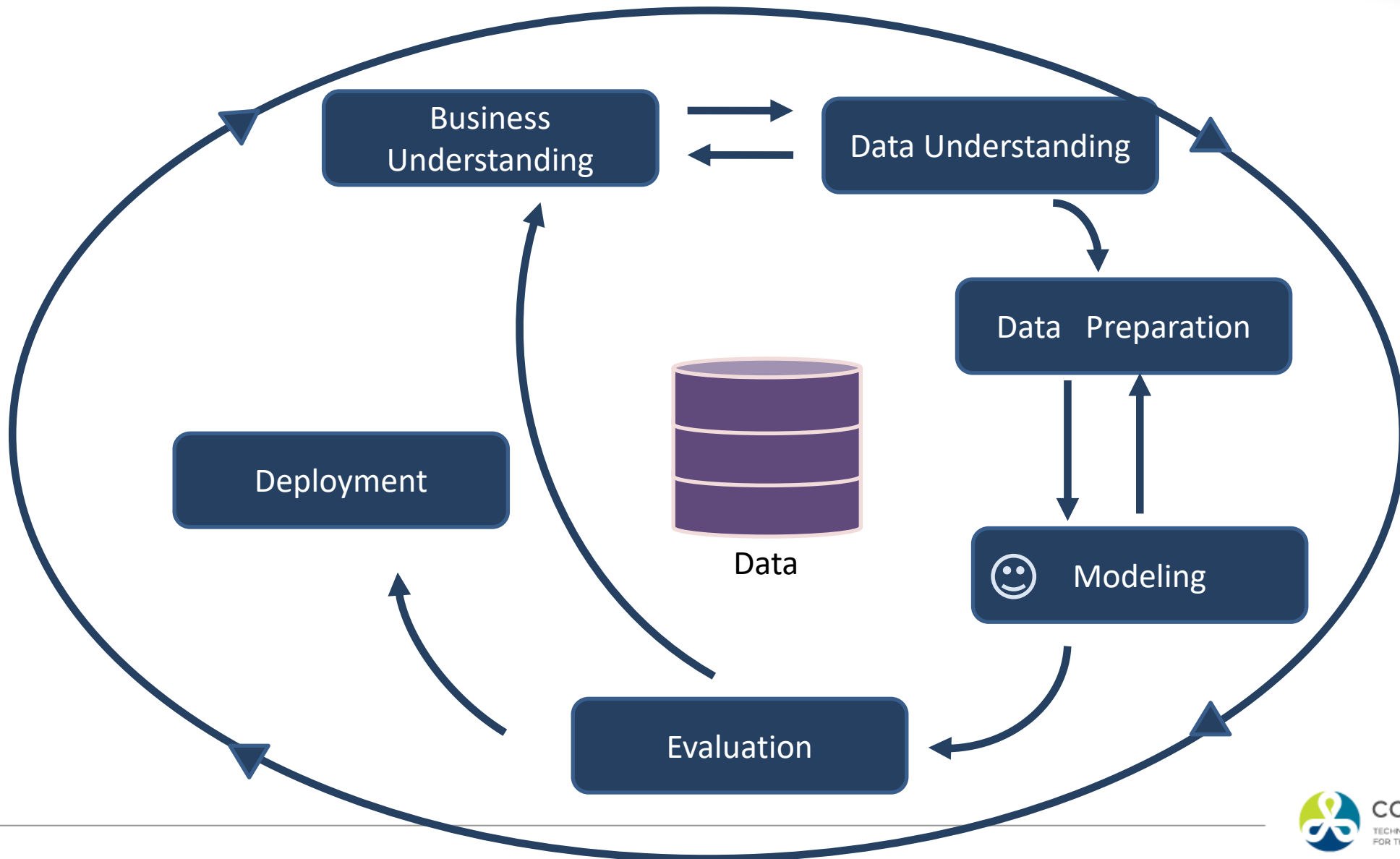
- The likelihood of an event defines what is a good bet, not whether it wins or loses.

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CRISP-DM Phases

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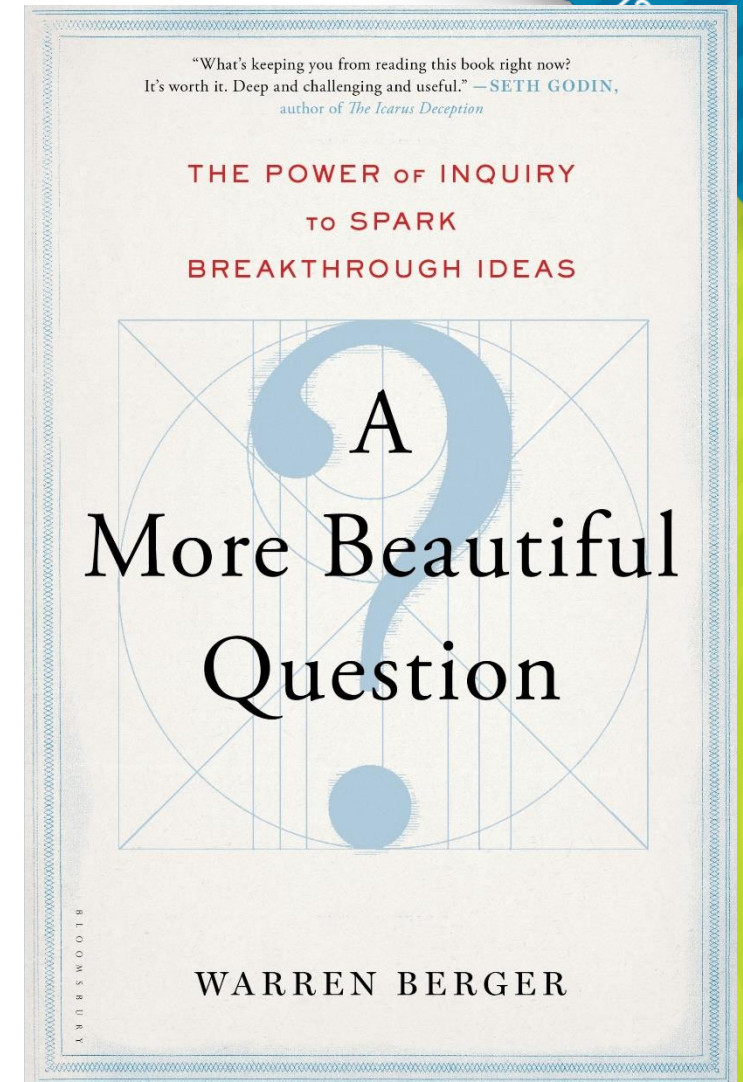


Good Questions/Hypotheses are Needed

What behaviors in the past year are most significant in terms of segmenting our customers?

What's the Life Time Value of each customer? What's a potential new customer worth?

Which products are purchased together most often? Which products are purchased with our most profitable products?



Listen to Data

- Relative importance
- Natural relationships
- Similarities/differences
- Predictions



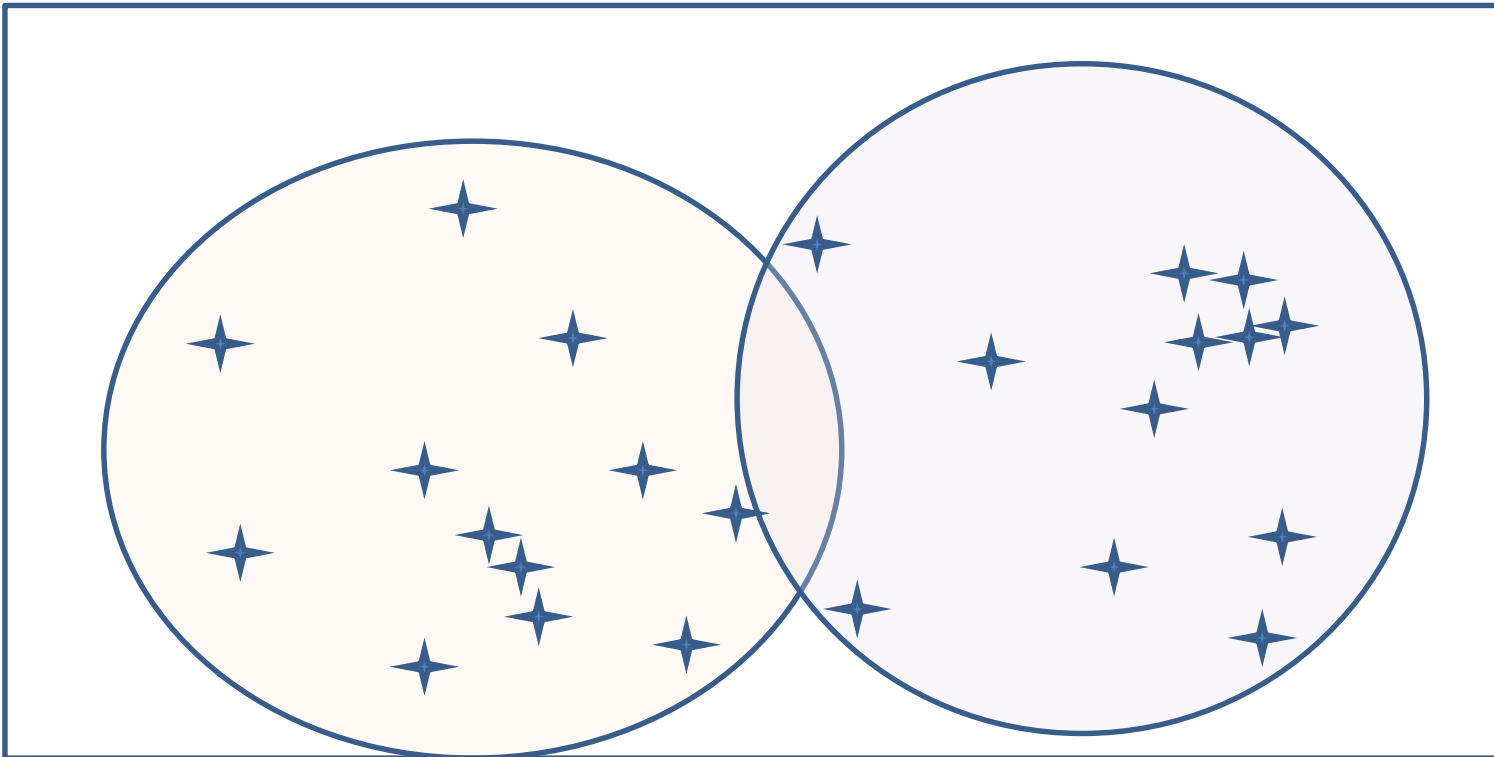
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Four Keys to Ensure AI Credibility & Adoption

- [illegible]

What is Clustering?

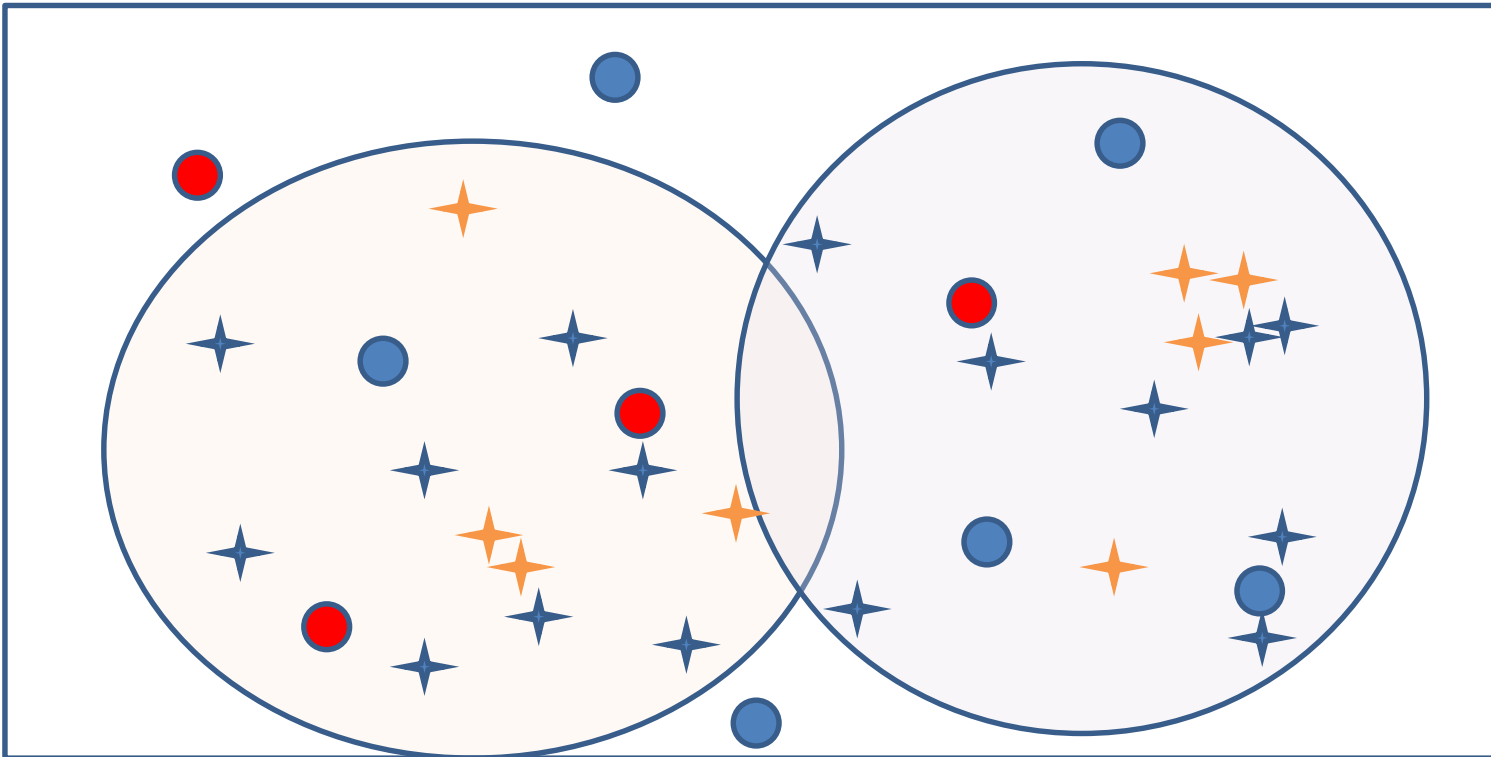
- Dividing a large set into smaller groups of similar and dissimilar members



More Dimensions Makes Clustering Harder

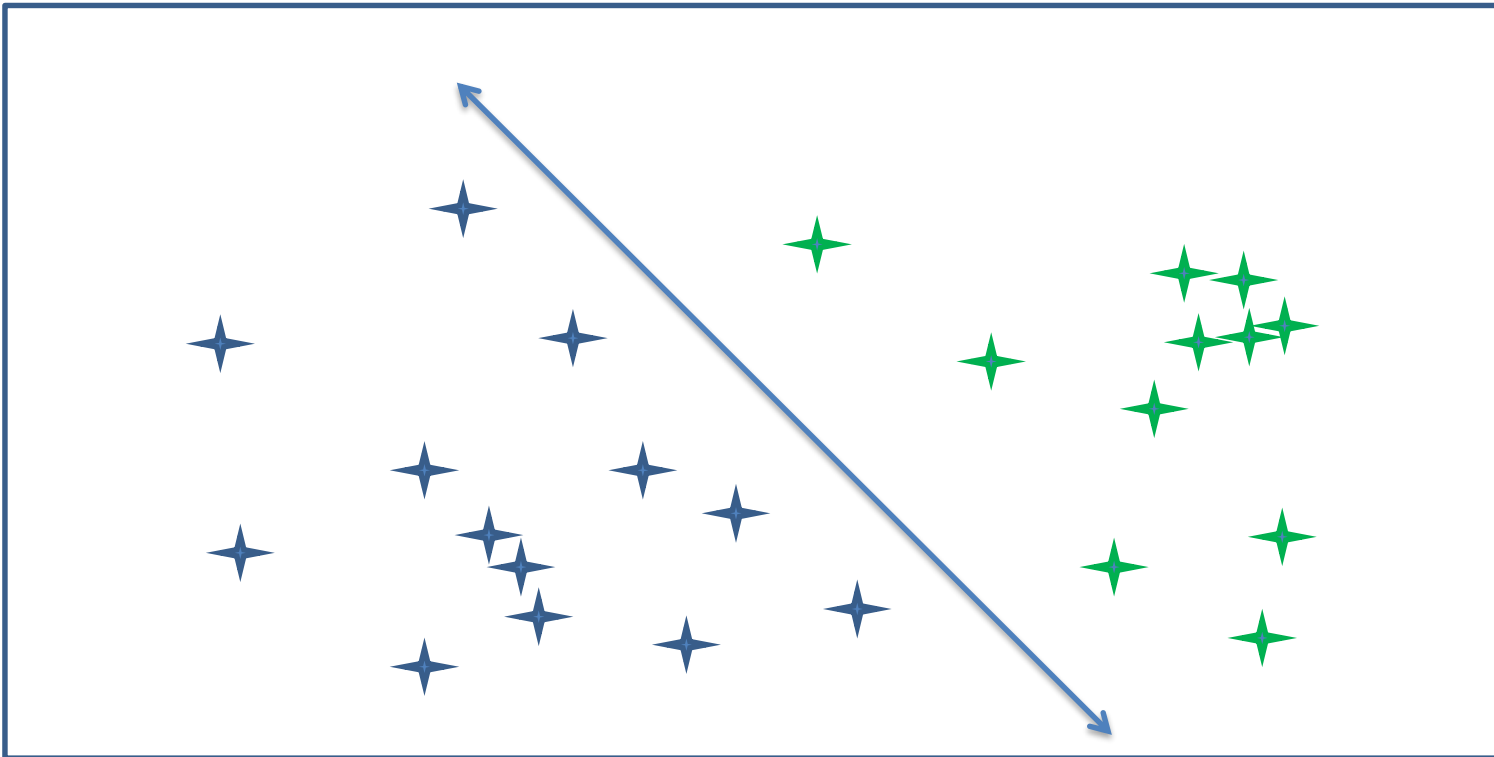
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- It's hard to visualize clusters with high dimensionality



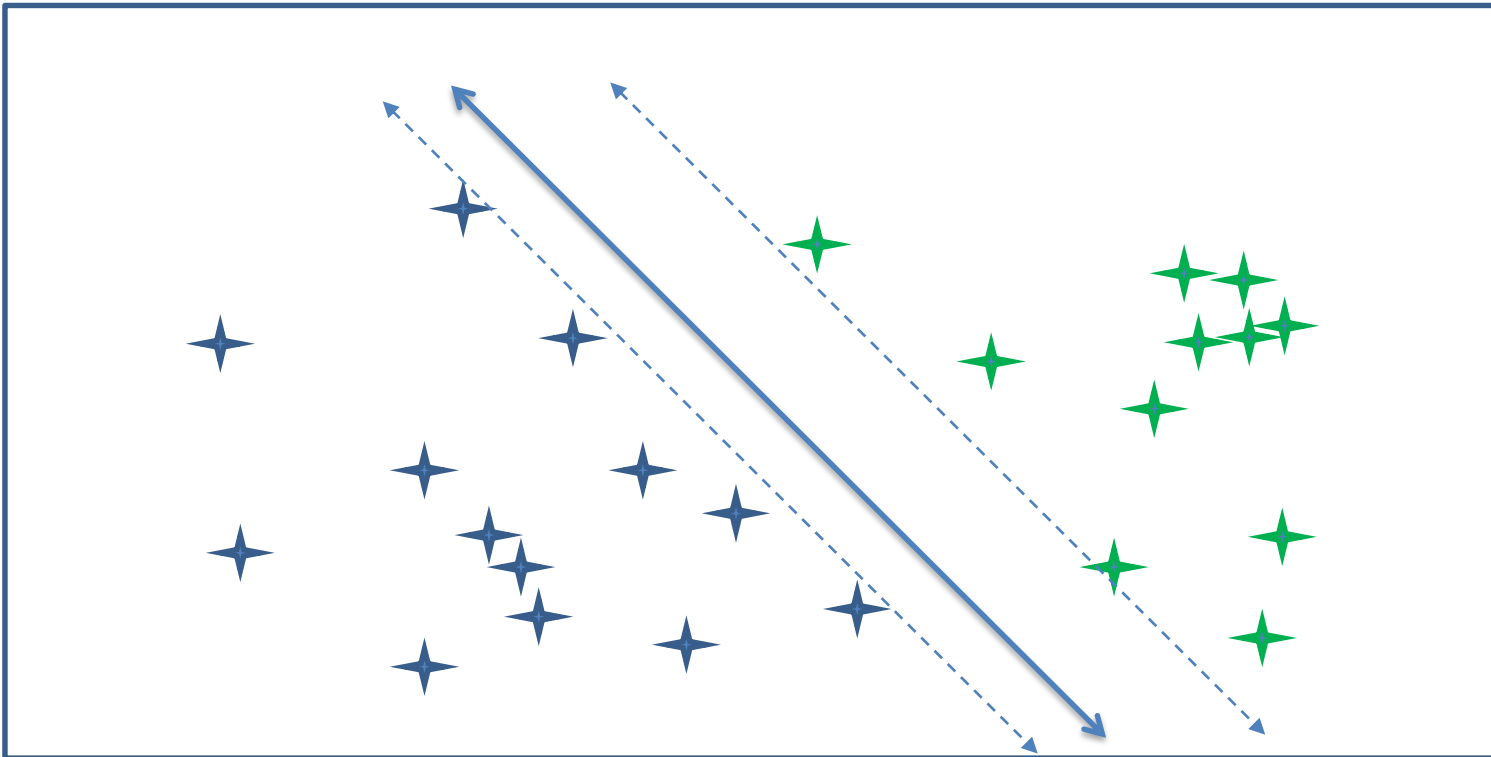
Classification

- Regression works well for linearly separable groups



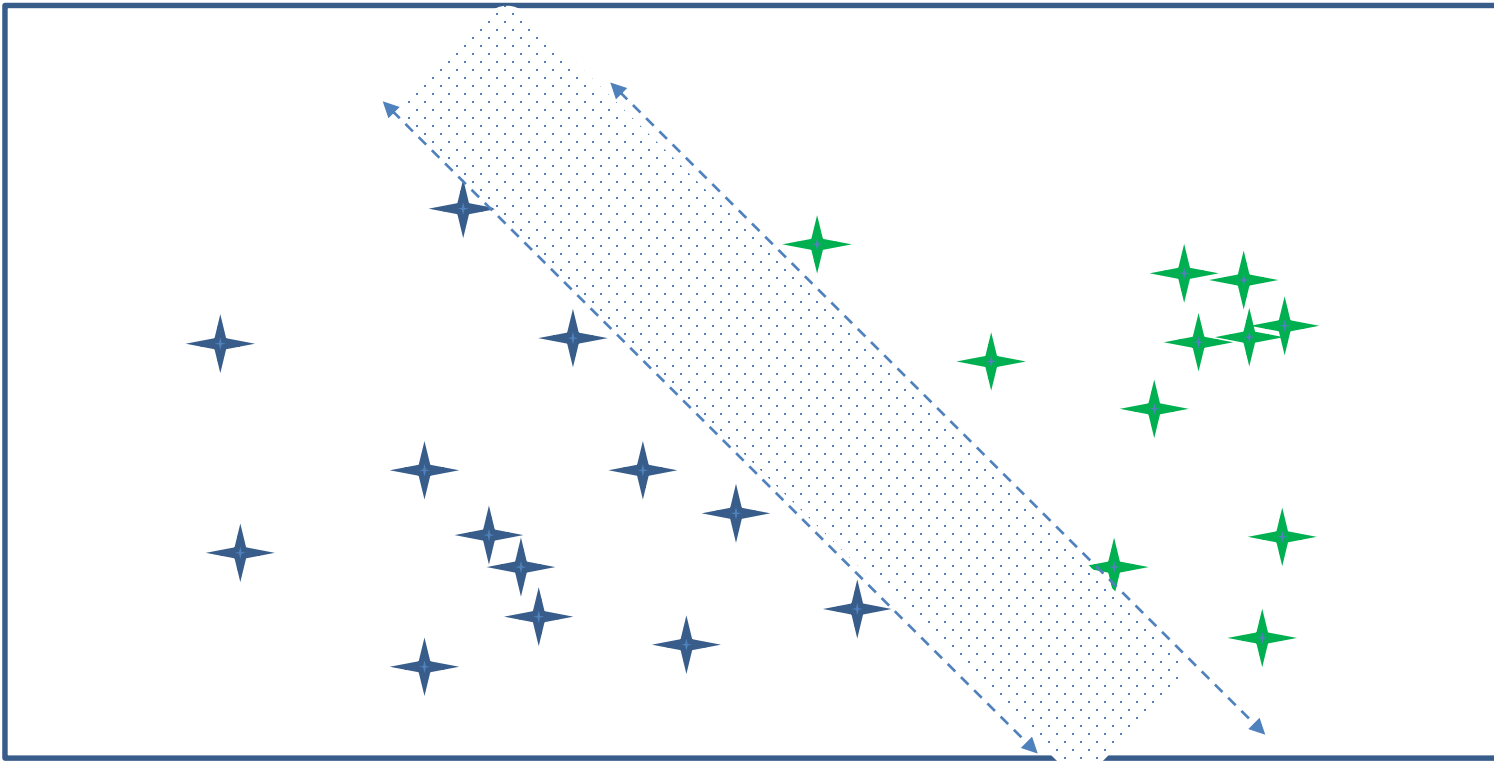
Classification

- Support Vector Machine works through identifying separable space



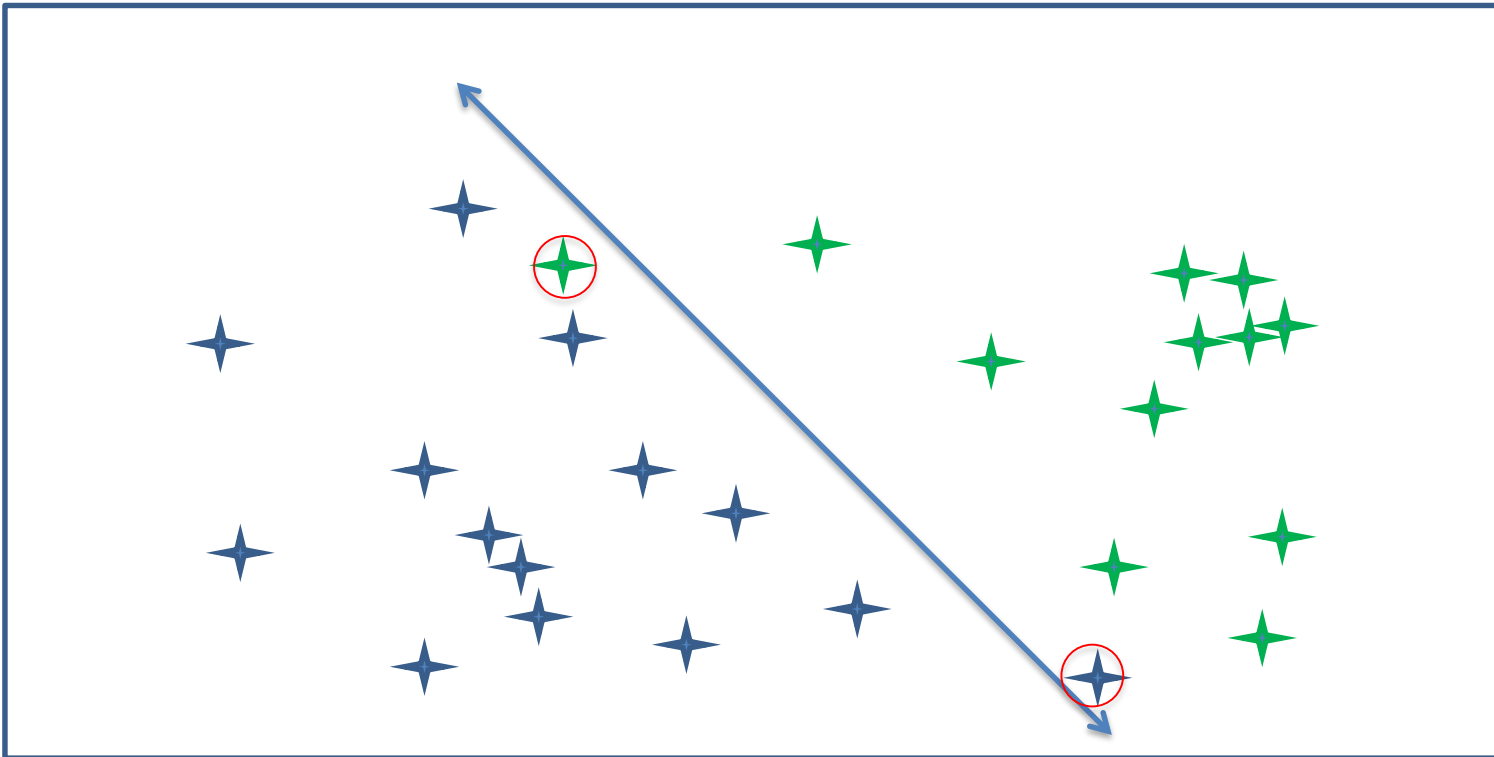
Classification

- Support Vector Machine works through identifying separable space



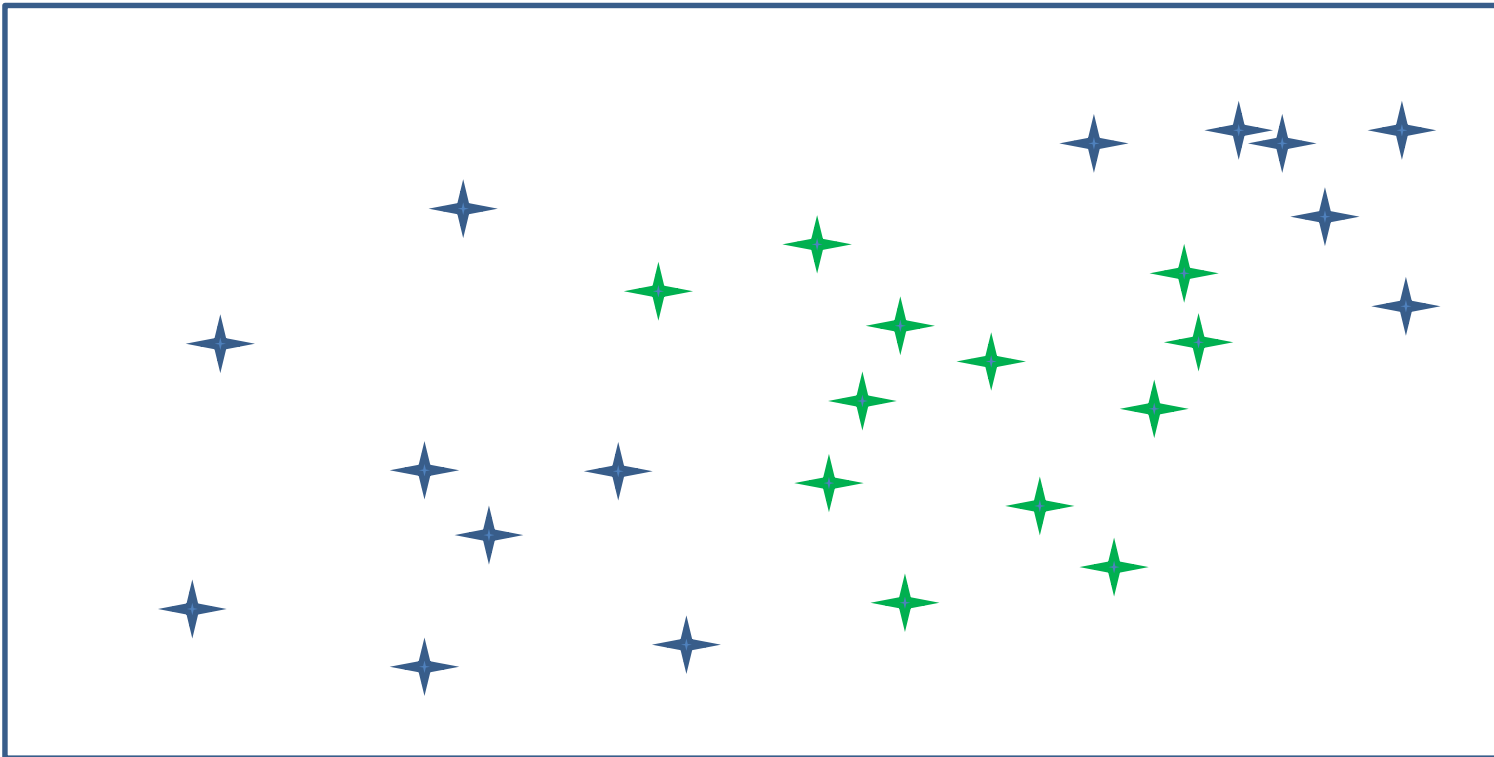
Classification

- Newly added members near the boundary may lead to errors



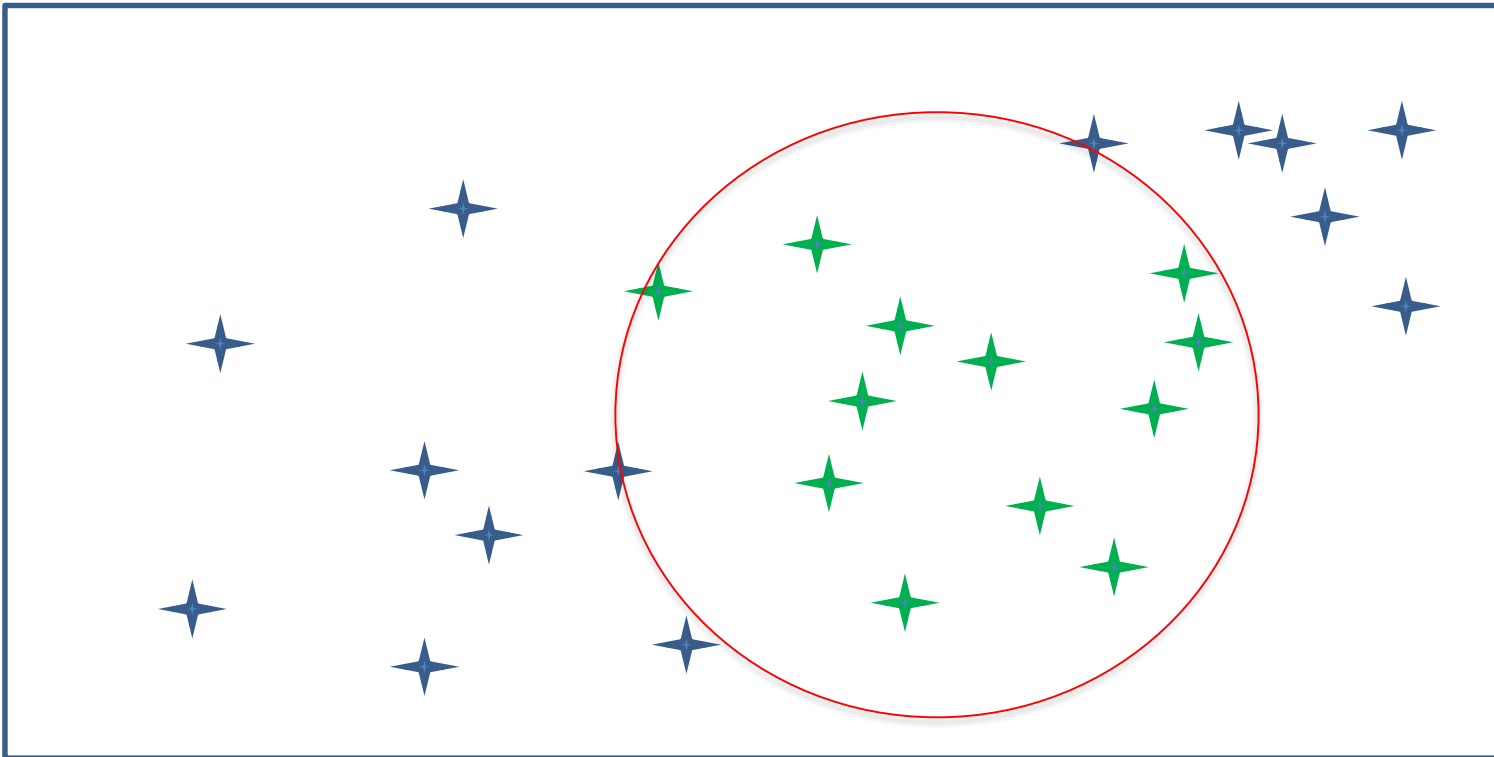
Classification

- Other patterns do not lend themselves to linear separation



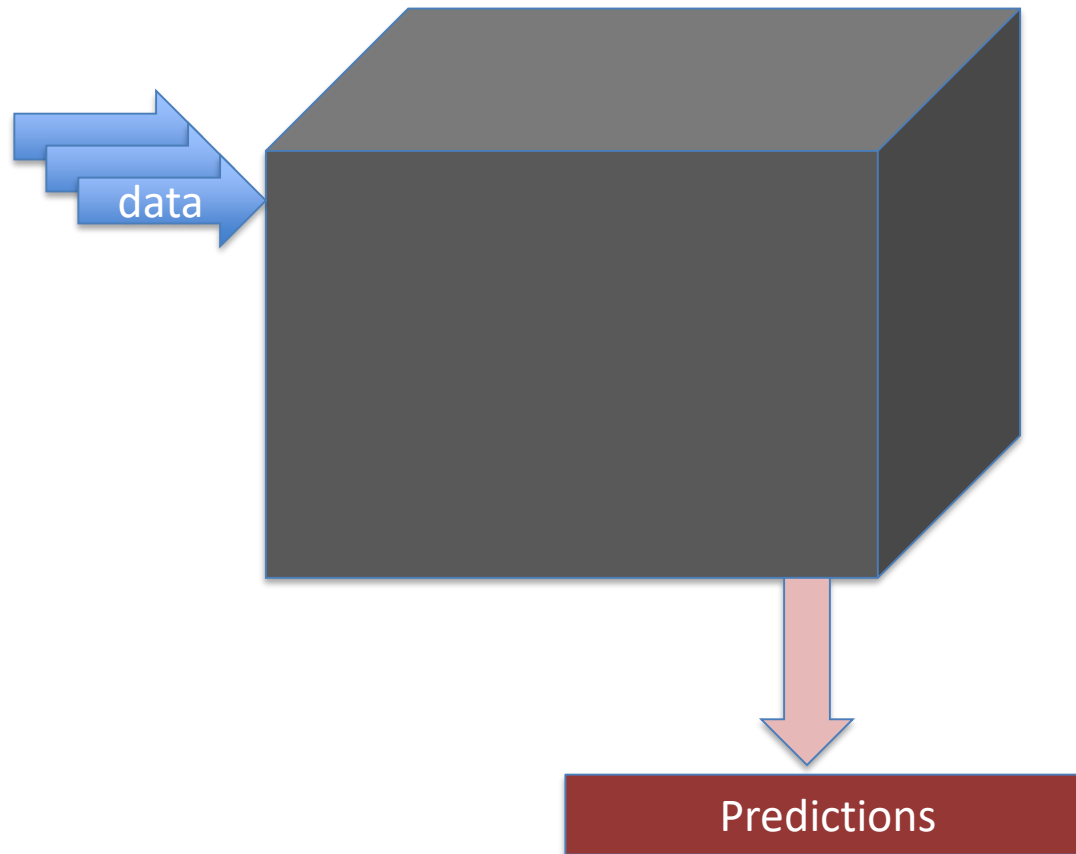
Classification

- Kernel functions in SVMs enable non-linear separations



Neural Nets are Black Boxes

- Can be very accurate compared with other methods
- Very difficult to explain outputs



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Overview of Oracle ML & Advanced Analytics

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- Oracle Applications (HCM, EPM, Retail, etc.)
 - Support or enable business functions or operations (**Software as a Service**)
 - Feature “Adaptive Intelligence” or software that has a built-in feedback for learning
 - Can include prebuilt reports and screens
- Oracle Analytics (OAC, DVCS, OBIEE, Essbase)
 - Provide a capability to develop analytics (**Platform as a Service**)
 - Feature machine learning and advanced analytics capabilities for citizen data scientists and professional business analysts
 - Provides the toolsets and frameworks
- Other Oracle
 - Advanced Analytics option to Oracle DB -- Oracle Data Mining, Oracle R Enterprise
 - Autonomous Data Warehouse Cloud Service - Oracle Machine Learning
 - Oracle R Advanced Analytics for Hadoop (ORAAH)
 - Oracle Stream Analytics, Property Graph algorithms, and much more

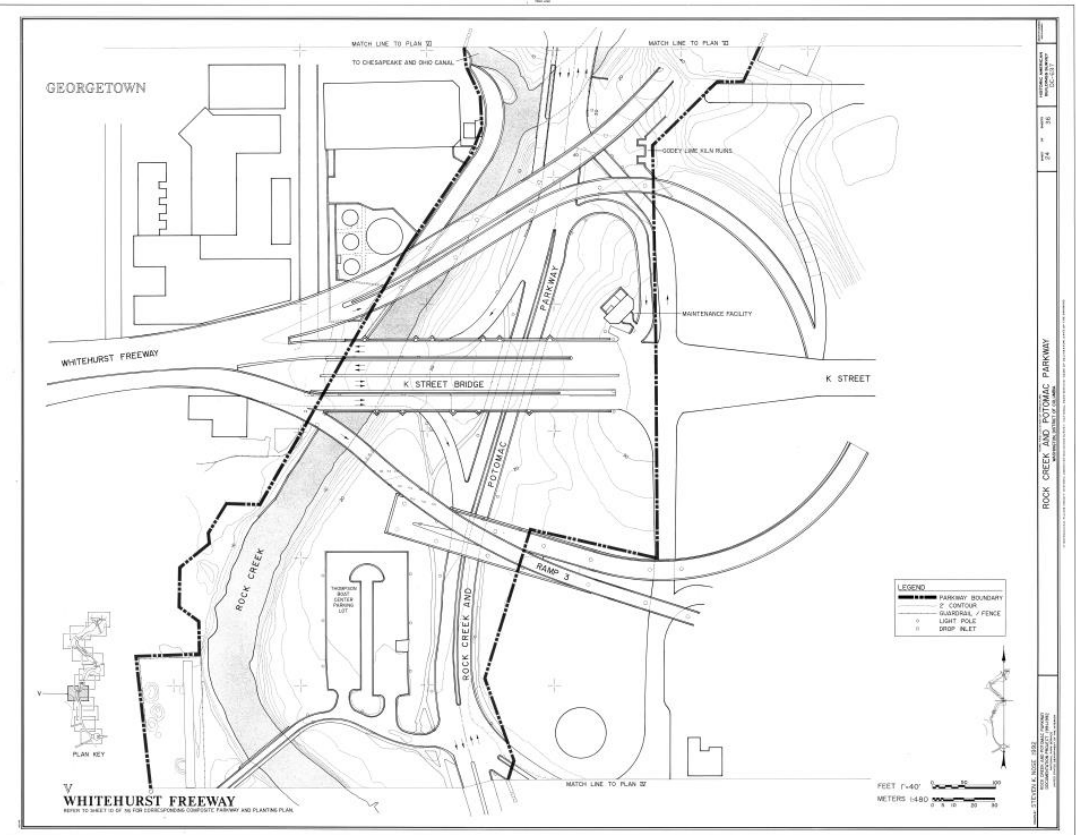
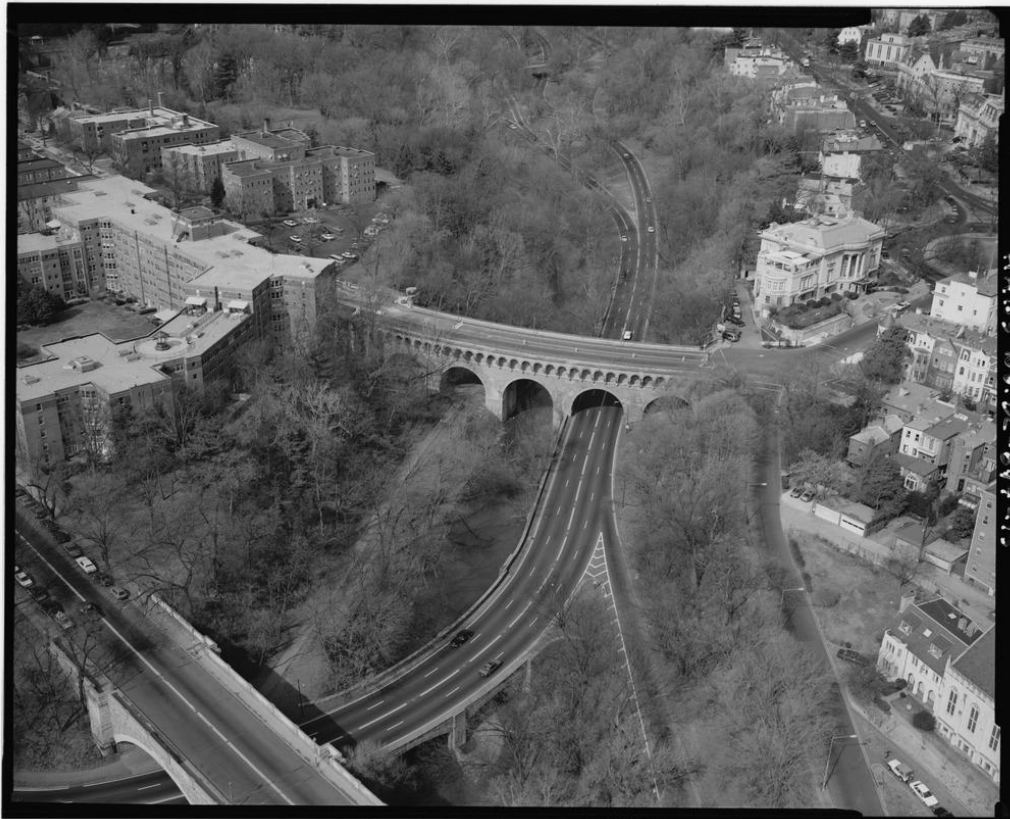
Major Use Cases and Algorithms

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- Predict Lifetime Value of Customers
 - Use regression to project current gross profit contributions into the future
 - Use clustering to group products and customers
 - Use classification to predict likelihood of defection/churn
 - Use decision trees to assign marketing program incentives
- Optimize production processes
 - Use classification to set acceptable run standards
 - Use regression to predict costs of bad quality
 - Use association rules to determine optimal warehouse layout

Easy and Hard

- Adaptive intelligence is accessible, but requires planning and knowhow



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Clean Data is Essential

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Dirty Data is a Pollutant



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Bounded vs. Unbounded Domains

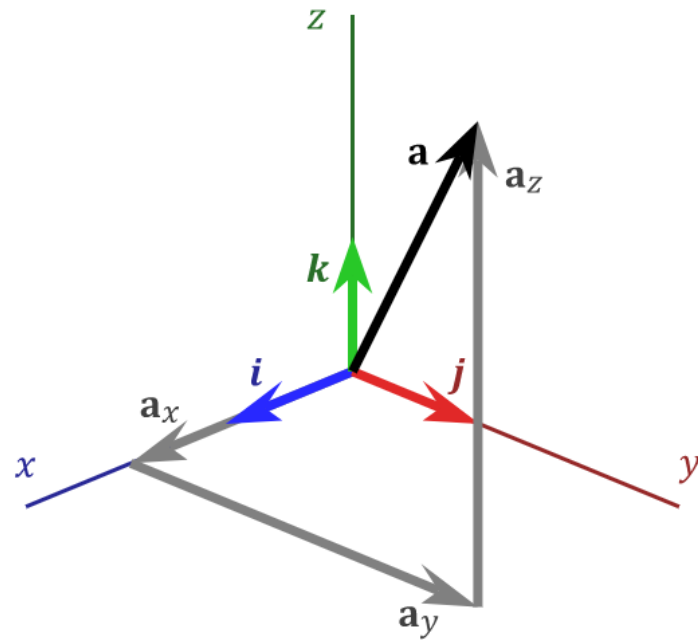
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- Bounded “games” like poker, baseball, elections, website A/B testing, etc.
 - Defined rules, time, and results
 - Can use “classic” statistics for prediction
 - Scale space is predetermined
 - Neural nets are excellent for classification exercises in bounded domains
- Unbounded games like the stock market, economic growth, forests, profitability, etc.
 - Significant challenges exist using “classic” statistics
 - Assumptions are both necessary and more important than anything else
 - Scale space is undetermined
 - AI does not do well with unbounded predictions

Linear Algebra is the new Calculus

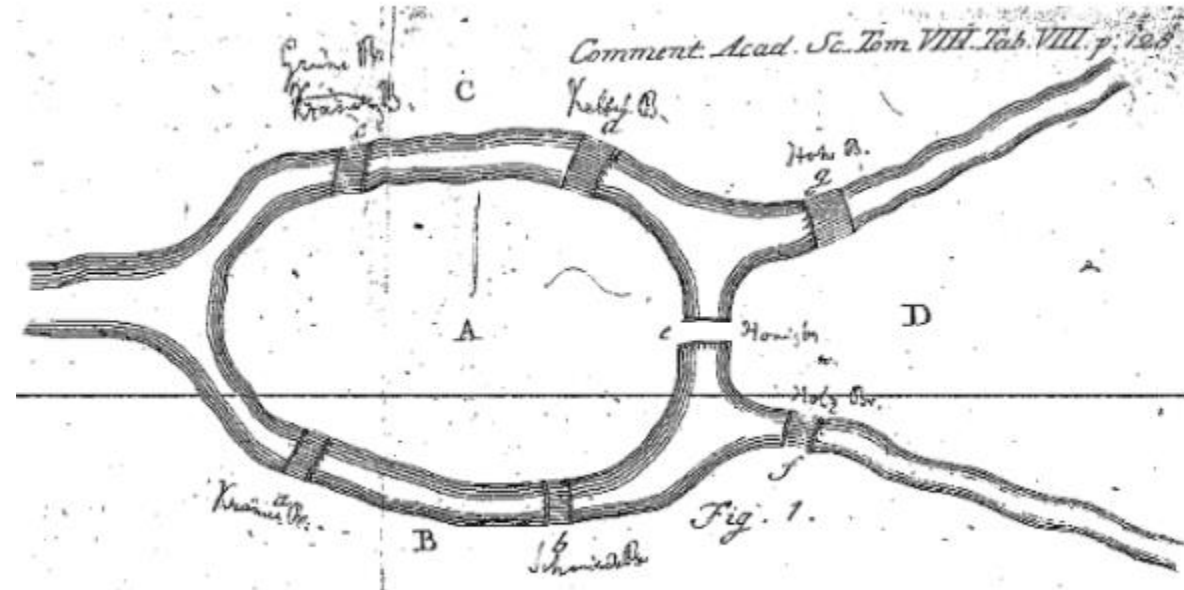
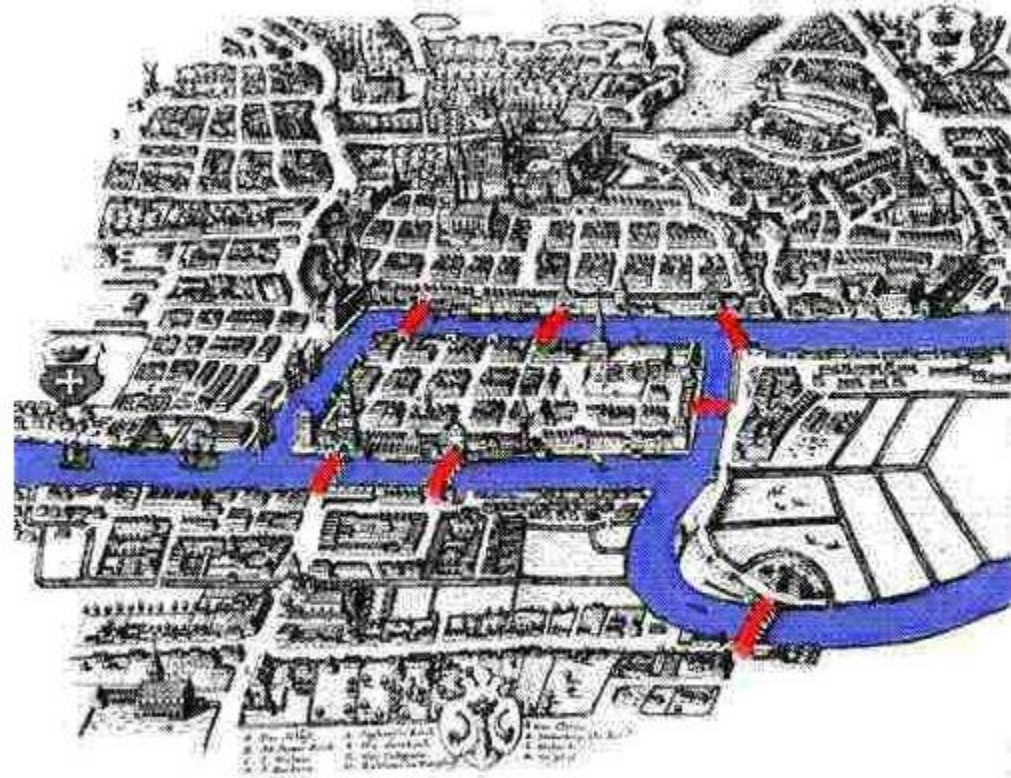
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- If calculus is the study of motion, change, and forces, linear algebra is the study of the relationships between members of a set as defined by equations.
- Linear Algebra deals with vectors, matrices, transforms, and graphs.



Bridges of Königsberg: Euler invents Graph Theory

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Euler's Figure 1 from 'Solutio problematis ad geometriam situs pertinentis,' Eneström 53 [source: [MAA Euler Archive](#)]

Frameworks for Thinking about AI & ML

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- Stakeholder analysis
- Negotiations/shared interests
- Fiduciary responsibility
- Risk management
- Security
- Data governance and Master Data Management
- Distributive Justice, Ethics, and Moral Philosophy
- Legal framework (HIPAA, FCRA, EU GDPR, etc.)
- Data Mining Frameworks (KDD, CRISP-DM, etc.)
- Complex Adaptive Systems, Systems Dynamics

European GDPR

(European General Data Protection Regulation)

- Pseudonymization and tokenization
- Consent is required
- Data Protection Officer
- Rights to data erasure
- Rights to data portability
- Rights to data access
- Data protection by design and default

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European GDPR

(European General Data Protection Regulation)

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- Lawful basis for processing
 - the data subject has given consent to the processing of his or her personal data for one or more specific purposes.
 - processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract.
 - processing is necessary for compliance with a legal obligation to which the controller is subject.
 - processing is necessary in order to protect the vital interests of the data subject or of another natural person.
 - processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller.
 - processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, in particular where the data subject is a child.

Bayes Theorem can simply stated

$$\blacksquare P(A | B) = \frac{P(B | A) P(A)}{P(B)}$$

- Conditional Probabilities are continuously updated with new results.
- Prior probabilities are updated as posterior probabilities.

Data Equity and Enterprise Valuation

- The value of data lies in its possession and use.
- The most important data for organizations is their operational data.
- Be **very** careful sharing data with outside organizations.

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Data Value and Data Equity Varies with

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- Importance (centrality x connectedness x influence)
- Uniqueness
- Consistency
- Completeness
- Cleanliness
- Freshness
- Refined state
 - Structure
 - Calculated measures
 - Engineered features
 - Aggregations

Analytics Vendors Value Your Data, Do You?

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- Assess the value you are losing through sharing your data
- Assess advantages of growing your analytics capability internally
- Raw data must be processed to provide higher value
- Are all algorithms and engineered features shared with you?
- Are your analytics vendors working with competitors?
- Sharing data means sharing enterprise value

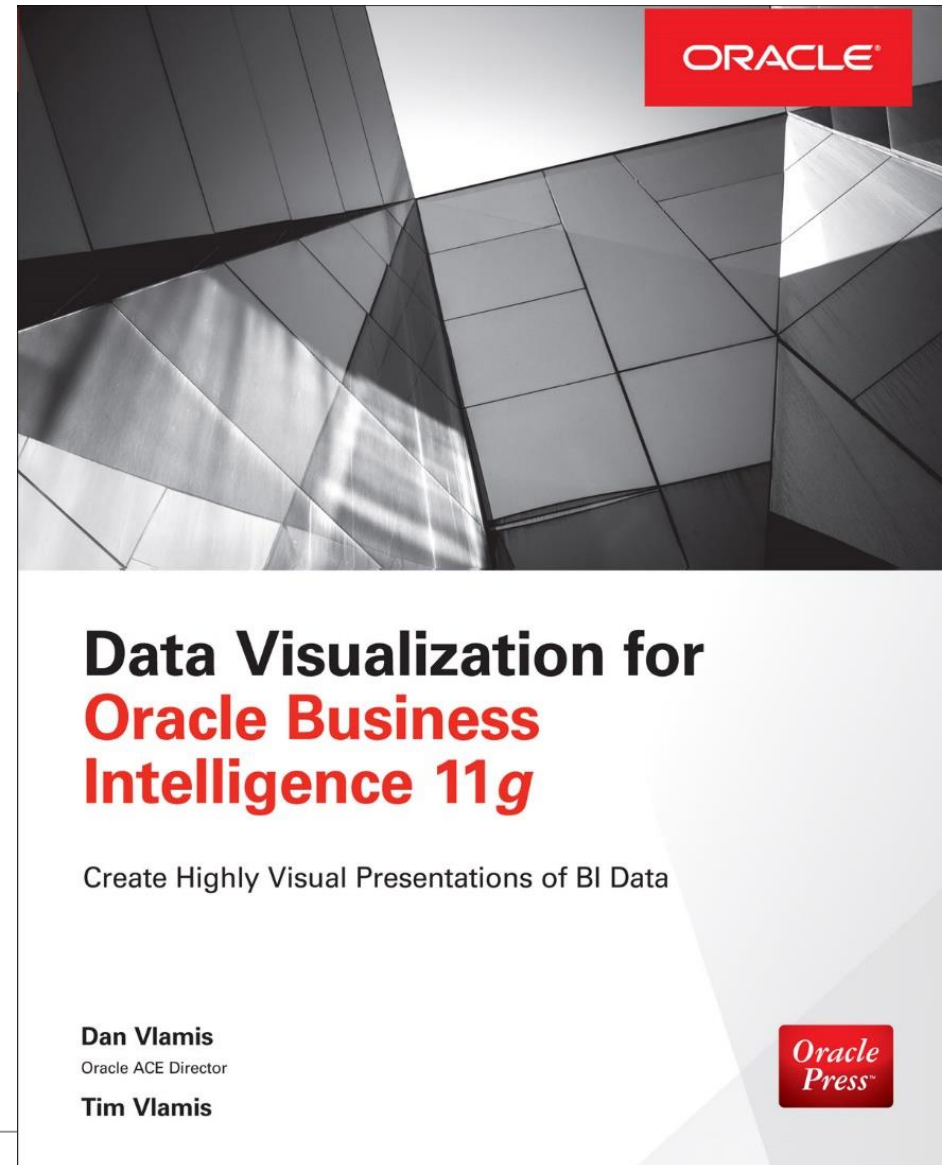
Summary

- You already encounter and work with Machine Learning every day.
- Learning a little language will help (you already know the concepts)
- Find people who know your business, like data, and can explain math
- Good questions are more important than good answers
- Start

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Drawing for Free Book

Add business card to basket
or fill out card



Resources

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- [Oracle's Rich Clayton writing about Adaptive Intelligence in CIOReview](#)
- [Is Murder by Machine Learning the New Death by PowerPoint? HBR](#)
- [Trust the Algorithm or Your Gut? HBR](#)
- [Oracle Advanced Analytics on OTN](#) (Oracle Data Mining, Oracle R Enterprise, Oracle Machine Learning)
- [Oracle Data Mining Blog](#)
- [Oracle R Enterprise Blog](#)
- [Oracle Analytics Cloud Machine Learning Blog](#)
- <https://www.kdnuggets.com/>
- <https://cran.r-project.org/>
- <https://www.python.org/>



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