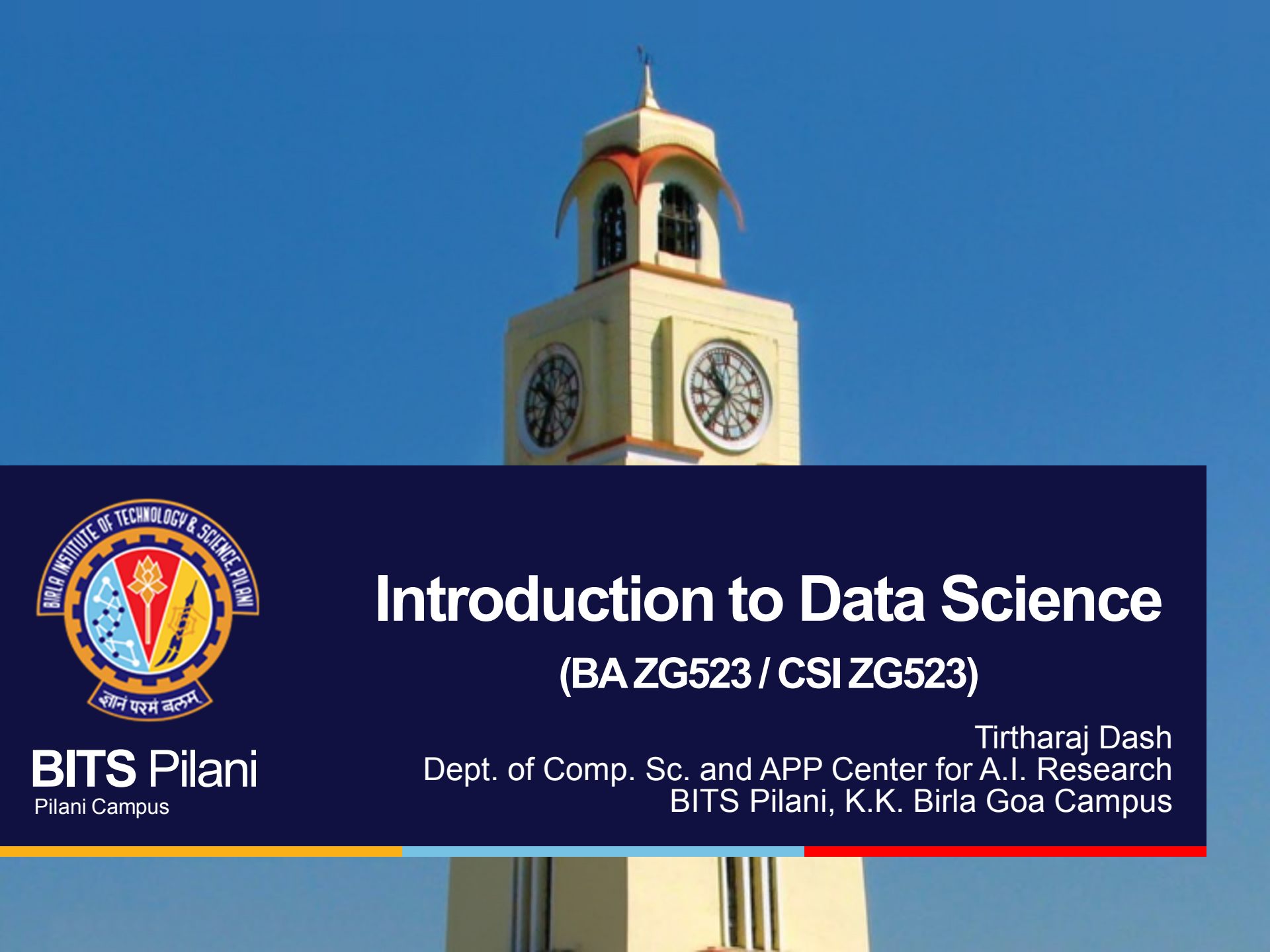

Introduction to Data Science

(BA ZG523 / CSI ZG523)

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Introduction to Data Science
Lecture No. 03 (C.H.: 5, 6)

Previous Lecture:

- Various stages in Analytics Process Model
  - Sourcing data
  - data mart
  - cleaning
  - transformation
  - analytics
  - interpretation and evaluation
- Roles and responsibilities of a data scientist
  - Works closely with business stakeholders
  - Understand business goals
  - Determines how data can be achieved to achieve these goals
  - Designs data modeling processes
  - Create algorithms and predictive models
  - Help analyze data and share insights with peers

Cont.

- Specific activities of a data scientist
  - Data gathering, preparation, exploration
  - Data representation and transformation
  - Computing with data, data modeling with ML, AI, statistics
  - Data visualization
  - Presentation.
- Data Science Ethical guidelines (6)
  - Autonomous machines
  - Bias, discrimination, exclusion
  - Algorithmic profiling
  - Preventing massive files
  - Quality, quantity and relevance
  - Human identity before human-machine hybridization
- Practical: Some basic Python programming.

Roles in a data sc. project

- Sometimes, these roles may overlap.

Role	Responsibilities
Project sponsor	Represents the business interests; champions the project
Client	Represents end users' interests; domain expert
Data scientist	Sets and executes analytic strategy; communicates with sponsor and client
Data architect	Manages data and data storage; sometimes manages data collection
Operations	Manages infrastructure; deploys final project results

[Source: T2, Ch.1]

- Client, Data architect, and Operations are not part of the data science team, rather they are collaborators.

Roles: Project Sponsor

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- The most important role in a project.
- They decide whether the obtained results are a success or a failure.
- Keep the project sponsor involved and informed about intermediate progresses and results.
- Getting clear goals from sponsor is important – best is to get quantitative statements.
- Example of a goal: Identify 90% of accounts that will go into default at least two months before the first missed payment with a false positive rate of no more than 25%.

Roles: Client

- Represents model's end-user interests.
- More hands-on than the sponsor.
- They form an interface between technical details of the project and the day-to-day expected works when the project is deployed.
- Keeping them informed and taking feedbacks during project is essential.

Roles: Data Scientist

- Responsible for taking all necessary steps to make the project a success.
- *Read more on this role from the previous lecture.*

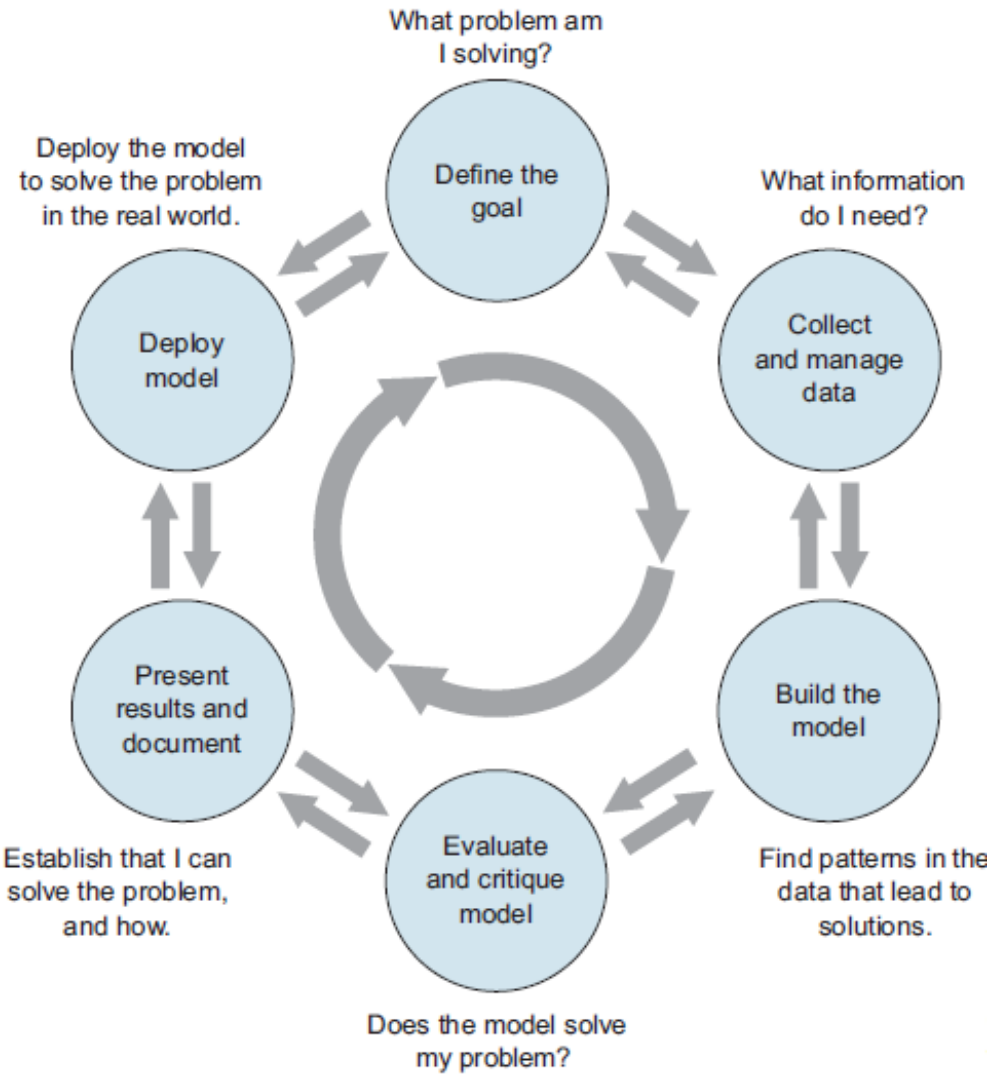
Roles: Data Architect

- The data architect is responsible for all of the data and its storage.
- Usually a database administrator or architect fills this role.
- Manages data warehouses.
- Only available for quick consultations (They manage many projects.)

Roles: Operations

- Critical role in acquiring data and delivering results.
- They are mostly from outside data science group.
- E.g. You have built a project for online shopping site. They are aware of the technicalities of deployment, response time, etc.

Stages of a data sc. project



[Source: T2, Ch.1]

Learn via an example:

- The problem of classifying bank customers as to whether they should receive a loan or not.
- Giving a loan to a bad customer who is (mistakenly) marked as a good customer results in a greater cost to the bank than denying a loan to a good customer marked as a bad customer.
- The client want to build a tool using ML to automate the process of customer classification and with reasonable accuracy* (**: we are at present not focused on this*)

- *For experimenting with stages, we will use a Python notebook, available in our Lab repo.*

Stage: Define the goal

- The first step is to define a quantifiable goal.
- The following questions are relevant:
  - Why do the sponsors want the project in the first place? What do they lack, and what do they need?
  - What are they doing to solve the problem now, and why isn't that good enough?
  - What resources will you need: what kind of data and how much staff?
  - Will you have domain experts to collaborate with, and what are the computational resources?
  - How do the project sponsors plan to deploy your results? What are the constraints that have to be met for successful deployment?

Stage: Collect data

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- Identifying the data you need, exploring it, conditioning it for suitable analysis.
- The following questions are relevant:
  - What data is available to me?
  - Will it help me solve the problem?
  - Is it enough?
  - Is the data quality good enough?

- Here we will focus on available dataset from the web [1].

[1] https://archive.ics.uci.edu/ml/datasets/statlog+(german+credit+data)

Stage: Modeling

- Try to extract useful insights from the data in order to achieve your goals.
- There can be back-and-forth between data collection phase and modeling phase.
- The most common data science modeling tasks are these:
  - *Classification—Deciding* if something belongs to one category or another
  - *Scoring—Predicting* or *estimating* a numeric value, such as a price or probability
  - *Ranking*—Learning to *order items* by preferences
  - *Clustering—Grouping items* into most-similar groups
  - *Finding relations—Finding correlations* or potential causes of effects seen in the data
  - *Characterization*—Very general *plotting* and *report generation* from data

Stage: Model Evaluation

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- Once you have a model, you need to determine if it meets your goals:
  - Is it accurate enough for your needs? Does it generalize well?
  - Does it perform better than “the obvious guess”? Better than whatever estimate you currently use?
  - Do the results of the model (coefficients, clusters, rules) make sense in the context of the problem domain?
- If you’ve answered “no” to any of these questions, it’s time to loop back to the modeling step or decide that the data doesn’t support the goal you’re trying to achieve.

Stage: Presentation

- Once you have a model that meets your success criteria, you'll present your results to your project sponsor and other stakeholders.
- You must also document the model for those in the organization who are responsible for using, running, and maintaining the model once it has been deployed.

Stage: Model Deployment

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- Finally, the model is put into operation.
- In many organizations this means the data scientist no longer has primary responsibility for the day-to-day operation of the model.
- But you still should ensure that the model will run smoothly and won't make disastrous unsupervised decisions.
- During maintenance of model, it may come back to data scientists.

Setting Expectations

- Setting expectations is a crucial part of defining the project goals and success criteria.
- The expectation is nothing but the model performance to satisfy the project goal.
- You should not set over-optimistic expectations.
- You should not keep too low expectations.

Cont.

- Determine the lower and upper bounds on model performance.
  - **The NULL model**: If you don't have an existing model to compare with, then the "obvious guess" is treated as a base model. You have to do better than this.
  - **The Bayes rate**: The limit on prediction accuracy due to unexplainable variance is known as the *Bayes rate*. You can think of the Bayes rate as describing the best accuracy you can achieve given your data.