Assignment 2 – From Board Game to Real-World Decision-Making Challenges

Course: 46750 – Optimization in Modern Power Systems (Fall 2025)

Deadline: 06 December 2025 at 23:59 (or 48h before oral exam)

Theme and Format

In this assignment, each **group (3–4 students)** acts both as a **client** and a **consulting company** in a simulated professional scenario. The goal is to identify, model, and communicate a decision-making problem inspired by the board game *Power Grid* through the lens of optimization.

The activity follows a role-playing structure mirroring a real-world consulting process—from **problem identification** to **solution pitch**—integrating both technical modeling and communication skills.

Connection to the Board Game *Power Grid*: The board game *Power Grid* serves as a rich and playful abstraction of real-world energy system operations. Its mechanics emulate key decision layers encountered in power systems and electricity markets—investment, procurement, network expansion, and production scheduling—while introducing strategic interactions, limited resources, and dynamic feedback between players. By translating these game dynamics into optimization problems, students explore how formal mathematical models can capture trade-offs between cost, risk, and competition. Each stage of the game naturally corresponds to a class of optimization challenges:

- **Stage 1 – Bidding for new power plants:** investment and auction-based decision-making under competition.
- **Stage 2 – Buying energy resources:** short-term procurement and portfolio optimization under price and supply uncertainty.
- **Stage 3 – Expanding the transmission network:** spatial planning and infrastructure investment with network constraints.
- **Stage 4 – Producing energy:** dispatch, OPF, and unit commitment problems balancing efficiency, cost, and demand satisfaction.

Through these analogies, the game provides *a simplified but realistic sandbox* in which to investigate how optimization can support rational, risk-aware, and strategic decision-making in modern power systems.

From Board Game Abstraction to Real-World Decision Problems:

While *Power Grid* provides a structured and engaging context for decision-making, its rules remain stylized and simplified. Both the **client** and **consulting groups** are expected to interpret the game mechanics critically—recognizing which elements mirror real-world challenges in power systems and which aspects are idealized for gameplay.

Clients should reflect on how the selected game stage (e.g., plant bidding, resource purchasing, network expansion, or energy production) maps to analogous decisions in real energy markets or operations. For example:

- Bidding for power plants may represent capacity expansion planning or participation in long-term energy auctions.
- Buying energy resources may correspond to short-term procurement of fuels or balancing services under uncertainty.
- Network expansion relates to infrastructure investment planning subject to regulatory and spatial constraints.

- Energy production connects to operational dispatch or commitment problems involving efficiency, costs, and renewable variability.

In each case, the client group should *adapt* the simplified game dynamics into a more realistic decision-making setting—clarifying which aspects are preserved (e.g., resource limits, budget constraints, competition) and which require reinterpretation (e.g., discrete game turns, deterministic outcomes, fixed player strategies).

Consulting groups, in turn, should leverage this translation when formulating their proposals: they must recognize the gap between the game abstraction and the operational or market realities their optimization models aim to inform. For instance, while *Power Grid* assumes perfect information and rational players, consultants may introduce uncertainty, imperfect foresight, or bounded rationality to make their models more realistic and decision-relevant. Through this process, both clients and consultants engage in model-based reasoning—balancing simplicity and realism to reveal how optimization can bridge theoretical insight and practical decision support. **The goal is not to replicate the board game literally, but to use it as a conceptual starting point for identifying meaningful optimization problems that reflect real-world complexity.**

The assignment progresses through five main phases:

Phase 1 – Problem Identification (Client Discovery) - 15%

Objectives & Setup

Goal: Identify and frame a meaningful decision-making problem inspired by the *Power Grid* that can be represented as an optimization problem.
Learning Focus: LO6–LO8.
Setup: Groups propose a strategic client problem where optimization in power systems could provide value. The brief must be realistic, meaningful, well-motivated, and scope the scope should be focused enough to enable consultants to develop a tractable project (within the time constraints of this course) while remaining open enough to allow the consultants to propose their own approach (you should not formulate the problem yourselves).

- As a group, select one of the four stages of the board game *Power Grid* (Stages 1- 4) each representing a distinct type of decision-making process in power systems. Each stage reflects a specific context where optimization can support decision-making (from short-term bidding strategies to long-term planning).
- **Identify the decision-maker** concerned by this stage. Be explicit about whose perspective you are adopting (e.g., a system operator, a market regulator, or a utility company). Clarify what this actor controls, what information they have access to, and what goals or incentives drive their decisions.
- **Brainstorm concrete decision challenges** within your chosen stage and select **one focused problem** to pursue. Move from a general idea ("how to buy fuel efficiently") to a well-defined challenge ("how should a player allocate a limited budget across multiple fuel types given uncertain prices and plant efficiencies?"). The goal is to define a problem that is small enough to be tractable yet rich enough to be interesting and realistic.
- **Decompose the problem into its optimization components**, but without writing any equations. Discuss qualitatively:
  - **Decisions:** What must be chosen or controlled? (e.g., which plants to buy, how much fuel to purchase, where to expand the grid).
  - **Objectives:** What is the decision-maker trying to optimize? (e.g., minimize cost, maximize profit, ensure reliability, reduce risk).

- **Constraints:** What limits or rules must be respected? (e.g., budget, capacity, market rules, physical or resource limits).
- **Data needs:** What information or parameters would the model require? (e.g., prices, demand forecasts, technology costs).
- **Uncertainties:** What aspects are unknown or variable? (e.g., fuel prices, demand, competitor behavior).

Focus on describing how these elements interact in words rather than symbols. Your goal is to communicate the *logic* of the decision problem, not its final mathematical form.

- **Justify the relevance, impact, and open challenges** of your chosen problem, acting as the decision-maker. Explain why solving this problem matters — economically, technically, or strategically. Discuss what makes it challenging: incomplete information, competing objectives, intertemporal effects, or strategic interactions. Reflect on how optimization tools could support better decisions (e.g., as part of a pre-feasibility study, real-time bidding support, or policy evaluation). End your brief with 2–3 sentences summarizing the expected value of an optimization-based analysis for this problem.

Instructions & Timeline

1. Submit a preliminary client brief by **November 5th at midnight**.
2. You will receive qualitative feedback from the teacher by **November 12th at midnight**, with potential improvements and points to refine/reframe with the consulting team.
3. Your client brief will be sent to a consulting team and they will submit a project proposal, **by November 11th at 19:00**.
4. **During class on November 12th**, you will have time to refine your client brief through discussions with the consulting team.
5. You can resubmit your client brief (final version) until **December 6th** or up to 48 hours before oral exam (if agreed upon in advance). This final version will be graded. **If you choose to resubmit the project proposal, please include a short description of the changes made (bullet points).**

Phase 2 – Consulting Project Proposals (Consultant Role) - 20%

Objectives & Setup

Goal: Respond to the client briefs from other groups by proposing optimization-based solutions.
Learning Focus: LO1–LO5, LO8.

- Each group receives 1-2 client briefs from peers. For each brief, your task is to act as a **consulting team** that designs a roadmap of optimization models capable of addressing the client's decision problem at different levels of depth and realism.
- Prepare a short consulting proposal that is both **modular** and **strategic**—showing how optimization can progressively help the client make better decisions (depending on their needs). The proposal should include the following components:
  - **Key challenges and unmet needs.** Begin by summarizing the client's problem in your own words. Identify the main challenges that make this decision non-trivial (e.g., uncertainty, interdependence between players, time-coupled constraints, or nonlinear effects). Highlight what the client currently cannot do or understand without optimization tools.

- **Proposed modeling roadmap.** Describe **two or three models** that increase in complexity and build upon each other. Each model should have a clear **purpose**, **scope**, and **expected insight**. *For example:*
  - **Model 1 – Deterministic baseline:** a simple model assuming perfect information and single-period decisions. It should clarify the structure of choices, constraints, and the objective function.
  - **Model 2 – Intertemporal or anticipative extension:** introduce foresight, investment coupling, or dynamic elements to capture decisions over multiple periods. Highlight how new constraints or objectives link across time.
  - **Model 3 – Strategic or uncertainty-aware model:** include either (a) competition among players using equilibrium constraints, or (b) uncertainty using stochastic or robust formulations. Discuss what additional insights this model could reveal compared to previous stages.

  Encourage conditional reasoning in your design, e.g.:

  > "If we observe that the deterministic model leads to over-investment under uncertainty, then we will introduce a stochastic model to test robustness."
  > "If players' decisions interact strongly, then an equilibrium formulation will be necessary to capture strategic effects."

- **Modeling assumptions, inputs, and decision variables.** For each model, specify:
  - **Decision variables:** what can be controlled or optimized (e.g., investment level, fuel purchases, flow allocations).
  - **Inputs and data:** parameters required (e.g., prices, demand forecasts, resource limits).
  - **Key assumptions:** simplifications that make the model tractable (e.g., perfect competition, linear cost functions, fixed demand).
  - **Model boundaries:** what is deliberately left out (e.g., no network losses, static competitor behavior).
- **Anticipated trade-offs between realism and complexity.** Discuss what each model gains and loses as you move along the complexity ladder:
  - What becomes more realistic? (e.g., inclusion of uncertainty, feedback, or dynamics).
  - What becomes harder? (e.g., data requirements, computational effort, interpretability).
  - When might a simpler model actually be more useful or transparent for decision-making?
- **Expected insights and value for the client.** Conclude with a short paragraph summarizing what the client could learn from each model. For example:

  > "Model 1 will provide a benchmark for cost-optimal operation under perfect foresight."
  > "Model 2 will quantify how anticipative investments affect long-term profitability."
  > "Model 3 will test the robustness of strategies against uncertainty or competitors' reactions."

  Emphasize how these insights support the client's decision-making goals (e.g., strategic planning, risk assessment, or policy design).

Phase 2 focuses on the response quality to the client brief, i.e. how you reframe & scope the client brief. So even if you get an incomplete/poorly structured/unrealistic client brief you can score VERY highly by: i) identifying ambiguities; ii) pushing back politely; iii) clarifying assumptions; iv) proposing alternative scopes

Instructions & Timeline

1. Prepare a draft of a project proposal (based on guidelines attached) for the client brief assigned to you (see file attached as feedback to your group in Phase 2 submission)
2. Submit a draft of your client brief by **November 11th** (in discussion areas created for the paired client and consulting teams in DTU Learn) so that the client team can read it before class - that first draft will not be graded
3. **During class on November 12th** - refine your project proposal with the client team (discussion) and help the client team reframe their brief into a tractable project (within the allocated time) that still delivers value.
4. Submit your updated project proposal by **November 12th (midnight)** - in *feedback fruits* - see available link in Week 10 - so that the client team can provide final feedback; and as an assignment on DTU Learn, so that the teachers can provide feedback.
5. Based on the feedback received you can resubmit your project proposal (final version) until **December 6th** or up to 48 hours before oral exam (if agreed upon in advance). This final version will be graded. **If you choose to resubmit the project proposal, please include a short description of the changes made (bullet points).**

Note: You do NOT have to answer all the requests in the client brief if they are unrealistic, and you can provide your own interpretation and recommendations to tackle the problem.

Phase 3 – Client Evaluation and Project Selection

Objectives & Setup

Goal: Evaluate the consulting proposals received for your client brief, rank them and evaluate whether you would "hire" them.
As a client team, you will review 1-2 consulting project proposals addressing your client brief, and provide feedback based on:

- Relevance and clarity in addressing the problem.
- Realism of scope and modeling plan.
- Potential value and impact of proposed results.

As a consulting team, you can use this feedback to refine your project proposal and adjust your project implementation.

Instructions & Timeline

1. As a consulting team: submit your updated consulting project proposal on feedback fruits (link available in DTU Learn - Week 10) by **November 12th at midnight**.
2. A a client team: rovide feedback to consulting teams on their updated project proposals on feedback fruits (link available in DTU Learn - Week 10) by **November 18th at midnight**.
3. Read and reflect on the feedback received, and use it to improve your project proposals.

Phase 4 – Iterative Model Development and Validation (Consulting Project Implementation) - 40%

Objectives & Setup

Goal: Implement the consulting project proposal submitted, solve a concrete problem using adequate mathematical models and optimization techniques and derive actionable insights **(answering the client's brief received from another group)**.
Learning Focus: LO1–LO13.
This stage of the project requires you to translate your proposed modeling roadmap into a functioning decision-support tool. You will progressively build, test, and refine a sequence of optimization-based models that capture the essence of the client's problem. Your objective is not only to produce numerical results, but also to understand how modeling choices affect recommendations, and to communicate clear guidance back to your client.
Note: You may need to update iteratively your project proposal based on your findings in this stage.

Instructions & Timeline

We recommend that you follow these steps and milestones:

1. **Start from the client brief received and your consulting project proposal (submitted in week 10).** Review the client's original problem statement and your proposed modeling roadmap. Decide how to implement it in practice. Use the peer feedback received during Phase 3, and the teacher's feedback, to refine:
   - Which assumptions and modeling choices remain valid and which ones need adjustment.
   - What simplifications are needed to make the problem solvable within the project scope.
   - What insights you expect to derive at the end of this project, and how they would create value for the client.
   - What numerical experiments are essential to test your hypotheses and support your insights.
2. **Develop a sequence of progressively more complex models.** Each model formulation should build on the previous one and provide new insight about the decision problem. The sequence below is an example; adapt it to your project as needed.
   (a) **Myopic deterministic model:** Formulate a single-period optimization problem assuming all parameters are known and static. This serves as a baseline to test the structure of your objective function, decision variables, and constraints. Focus on getting a valid and interpretable solution first (e.g., least-cost dispatch, profit-maximizing bidding).
   (b) **Intertemporal or anticipative model:** Extend the model to include multiple periods or future effects. Introduce coupling constraints that capture investment, storage, or dynamic decisions. Highlight how anticipative behavior changes results compared to the myopic case.
   (c) **Strategic or equilibrium model:** Incorporate the reactions of other agents or market mechanisms. This can be done via complementarity constraints, equilibrium formulations, or game-theoretic approximations (Cournot or Bertrand competition, residual demand curves). Discuss trade-offs between realism and tractability.

(d) **Uncertainty or risk-aware model:** Represent uncertainty in **key** parameters (e.g., prices, demand, renewable output). Choose an uncertainty modeling approach consistent with your context:

- Discrete scenarios or continuous uncertainty sets.
- Single or multi-stage decisions with non-anticipativity constraints.
- Chance constraints or robust constraints.
- Risk-neutral, risk-aware or worst-case objective function.

Compare results against deterministic benchmarks and discuss how uncertainty changes decision robustness and efficiency.

3. **Implement these models in a programming language** of your choice. Try to structure your code in a flexible way, so that you can reuse part of the code when building more and more complex models and can run numerical experiments and sensitivity analysis in a systematic and structured way. Document your code and keep track of changes.

4. **Design and conduct numerical experiments.** Deliberately and rigorously plan, run, and interpret your numerical experiments: choose only those analyses that help you validate and compare your models meaningfully (e.g., expected profit vs. carbon emission trade-offs, changes under risk preferences, effects of intertemporal decisions, strategic interactions, etc.) and generate insights directly connected to the client's original questions. Carefully select scenarios, input parameters, and performance metrics that are directly relevant to the client's problem (e.g., cost, profit, risk, flexibility) and provide coherent comparisons across the models. Identify the data needed for these experiments and determine where to obtain it (or how to simulate it credibly). Run experiments systematically and in a structured way. Carefully select the most relevant results, that meaningfully support your recommendations and the decisions the client must make.

5. **Reflect critically on models/results limitations:** Based on your numerical experiments, explore the trade-offs between realism, complexity, and computational effort. Reason about when additional modeling detail changes decisions significantly, and when it does not. Reflect critically on:

   - Which assumptions had the largest impact on results.
   - What trade-offs you made between accuracy, interpretability, and solvability.
   - What extensions could make the model more general or realistic in future work.

   Reflect critically on the limitations of your experimental setup, how realistic it is, how it impacts the generalization of your results and insights and how it could be improved.

6. **Iterate based on feedback (optional).** Throughout Weeks 10–13, you will have opportunities to pitch intermediate results and receive feedback from:

   - **Peers:** critical questions and comparative insights across projects.
   - **Teachers:** technical feedback on modeling logic, tractability, and interpretation.
   - **Industry guests:** comments on realism, decision relevance, and communication clarity.

   Integrate this feedback to refine your models, assumptions, and narrative. Tip: Explicitly document what changed after each round of feedback (e.g., "We linearized constraint X to improve solvability" or "We added uncertainty in fuel cost after discussion with peers") in your final report.

Phase 5 – Insights and Storytelling - 20%

Objectives and Setup

Goal: Present your final work as a consulting company pitching your modeling approach and optimized solutions to your clients. The goal is not only to present results, but to interpret them in a way that helps the client make better decisions based on the evidence your models provide.

Learning Focus: LO13 - LO14.

Instructions & Timeline

After running your experiments and comparing the different model formulations, your task is to translate technical results into clear, decision-relevant insights for the client. Focus on answering the core questions raised in the client brief and highlight how your modeling choices influence the conclusions. Your insights should:

- Directly address the client's objectives, constraints, and decision context.
- Distinguish between findings that are robust across models and those that depend on specific assumptions.
- Explain why certain decisions (e.g., investments, dispatch strategies, bidding behaviors) change when uncertainty, intertemporal effects, or strategic interactions are introduced.
- Summarize the key trade-offs revealed by your analyses (e.g., cost vs. flexibility, short-term gain vs. long-term performance).
- Identify actionable recommendations—practical next steps, threshold conditions, or rules-of-thumb the client can rely on.
- Explicitly acknowledge limitations, data gaps, and assumptions that could influence the reliability of your conclusions.

Tools and Support

- Python, Gurobi, `numpy`, `pandas`, `matplotlib`, `pyomo` (optional).
- Q&A and office hours: Weeks 10–12.
- Formative assessments (optional): in-class project pitch and feedback.

Deliverables & Deadlines

Students must submit each deliverable by the stated deadlines (penalties up to 50% of the grade associated with that deliverable/stage may be applied for excessively late submissions), but they may continue refining and resubmitting their work until the final resubmission deadline. Only the latest version submitted before this final deadline will be evaluated. This allows students to incorporate feedback, improve clarity, and strengthen their results throughout the project period. The deliverables and their corresponding deadlines are summarized in Table 1.

Evaluation

Assignment 2 Grading (group-based)

Evaluation Principles:

Each group is evaluated both as a client and a consultant, across the five main phases described above, and receives a score between 0-100%. Please keep in mind the following overall evaluation

Deliverable	Description	Deadline
Client Brief (Phase 1)	Approx. 1 page; describing context, decisions, objectives, constraints, desired optimization support, and target model complexity. *Template, guidelines, and an example will be provided on 31/10/2025.*	05/11/2025 EOD for preliminary version; 06/12/2025 EOD (or up to 48 hours before the oral exam with prior agreement) for final version.
Consulting project proposal (Phase 2)	Approx. 1-page; summarizing your (re)framing of the client brief and proposed roadmap to tackle the problem. *Template, and guidelines will be provided on 05/11/2025.*	11/11/2025 EOD for preliminary version; 12/11/2025 EOD for updated version - refined with client team's inputs; 06/12/2025 EOD (or up to 48 hours before the oral exam with prior agreement) for final version.
Feedback Form (Phase 3)	Including grading and qualitative feedback of the consulting project proposals. *(Evaluation form with grading rubrics will be available in Feedback fruits from 11/11/2025-18/22/2025)*	18/11/2025 EOD.
Final Project Report (Phase 4 - 5)	Recommended: 5 pages; Maximum: 10 pages; summarizing: i) model formulations and assumptions; ii) numerical results (experimental design and analysis of results); iii) insights and concrete recommendations for the clients; iv) limitations and recommended extensions. *Note: You do not need to include the motivation and framing of the problem in this report since they should be included in your consulting project proposal (Phase 2) and come from the client brief (Phase 1).*	; 06/12/2025 EOD (or up to 48 hours before the oral exam with prior agreement).
Code (Phase 4)	Reproducible and readable code, will all data needed listed, README file and all dependencies needed documented.	06/12/2025 EOD (or up to 48 hours before the oral exam with prior agreement).
Oral Presentation (Phase 5)	Approx. 5 minutes; covering: i) interpretation/framing of the client brief; ii) modeling approach, focusing on progression based on feedback received; iii) key results and real-world implications/lessons learned, focusing on concrete recommendations and value created for the client; iv) Limitations and recommended extensions (e.g. if the client wanted to hire them for a follow up study) **Important: Make sure the presentation is split adequately among all group members, and everybody has time to speak!**	08/12/2025 - 19/12/2025 (oral exam).

Table 1: List of deliverables and deadlines

principles:

- The goal is not to build the most complex model, but to demonstrate mastery of model-based reasoning, creativity in design, and clarity in communication.
- The main goal is to help the client make better decisions based on the evidence your

models provide, and create value for the client.

- Rather than presenting many numerical results, the students are expected to carefully curate the most relevant ones and interpret them in a way that supports their insights/recommendations to the clients.
- Equal contribution and team coordination are assumed; adjustment ratios may be applied to account for unequal participation during the oral exam.
- Iterative improvement and integration of feedback are rewarded throughout all stages.

Grading Rubric:

Phase 1 (15%)

- **Problem Motivation & Context (3%):** How clearly is the problem situated in real energy systems? Is it relevant and meaningful? Does it connect to actual system / market challenges? Does the brief explicitly identifies how the game's simplifications differ from real-world settings and what limitations should be addressed.
- **Clarity of Problem Statement (4%):** Is the central question understandable? Is it explicit what decision is to be supported? Is jargon used responsibly?
- **Stakeholder Framing & Role Definition (1.5%) :** Who is the "client" in this world? What is their position, interests, constraints, incentives? Is this role consistent + coherent?
- **Tentative Direction on Data & KPIs (1.5%):** What data or types of data would plausibly matter? What KPIs / outcomes matter to the client? They don't need to be fully defined — but they need to exist conceptually.
- **Optimization Potential (3%):** Is this a problem where optimization is non-trivial and meaningfully applicable? Does it contain design choices, trade-offs, scenario elements that optimization can illuminate?
- **Creativity, Engagement & Plausibility (1.5%):** Is the brief original, engaging and open in real-world complexity? Does it inspire meaningful consulting project proposals?
- **Use of feedback & refinement (0.5%):** How well did you incorporate feedback from teacher and collaborate with the consulting team to refine your client brief?

Phase 2 (20%)

- **Problem (re-)framing (5%):** Ability to identify the relevant assumptions/objectives/trade-offs in the client brief. How well the team diagnoses potential weaknesses/ambiguities/missing info in the client brief and (re)frames them.
- **Creative project scoping (5%):** Ability to propose a well-scoped and tractable project, with iterative model improvements, and motivate the approach/steps chosen based on the time constraints of the project.
- **Rigorous technical approach (5%):** Proposed modeling approach, data needs, evaluation metric.
- **Using feedback (5%):** How well did you incorporate feedback and collaborate with the client team to refine your project proposal?

Phase 3 (5%)

- **Clear feedback (1%)**: The evaluation and ranking are easy to follow, well structured, and show understanding of each proposal.
- **Constructive feedback (2%)**: Comments include specific, actionable suggestions to help teams improve.
- **Caring feedback (1%)**: Feedback is respectful, fair, and shows genuine engagement with

the teams' work

Phase 4 (40%)

- **Modeling correctness & progression (20%)**: Mathematical models are correct and show a clear progression between them; all notations are clearly introduced; all equations are explained one by one.
- **Experimental design & numerical analysis (10%)**: Thoughtfully designed and systematically carried-out numerical experiments, including carefully selected scenarios, performance metrics (cost, profit, risk, etc.), carefully curated *key* results. Ultimately, the numerical analysis should demonstrate that you used experiments not just to produce numbers, but to generate insightful evidence to validate your models and support your recommendations to the client.
- **Critical reflection & limitations (3%)**: Critical analysis of modeling choices: trade-offs between model complexity, realism, and interpretability; and experimental design: generalization of results and insights for real-world applications. Recommendations for future extensions.
- Reproducibility & code quality (5%): Clean, documented code; runs without modification; README file explaining how to reproduce key results
- Use of feedback (2%): The group integrates feedback from peers, instructors, and experts to models and experiments.

Phase 5 (20%)

- **Organization and clarity (5%)**: The consulting project proposal and final project report are well written and structured, with a clear flow, logical links, and concise writing.
- **Insights and storytelling** (10%) The final project report and oral presentation communicate a coherent narrative, from problem framing to concrete recommendations supported by numerical evidence. The analysis provides intuitive interpretation of the results and meaningfully supports the recommendations and insights derived. The value creation for the client is clearly articulated, and the insights are communicated in a way a broad audience can understand.
- **Visualization quality** (5%) Thoughtfully designed and curated graphs and tables (not an overload of figures) that are easily interpretable and clearly illustrate key results.

Bonus (up to +5%): Exceptional integration of interactive or visual tools (e.g., dashboards in Plotly Dash or Streamlit), advanced scenario analysis, or innovative presentation formats that significantly enhance communication of results.

Final Grade Calculation (Individual)

Your final individual course grade will be computed as follows:

1. An individual preliminary score between 0-100% will be calculated based on:
    - 40% from Assignment 1 (including bonus question) - individual grade accounting for participation coefficient adjustments.
    - 60% from Assignment 2 - group-based grade for Phases 1 - 5.
    - Bonus points from the Data Visualization Challenge, Learning Activity Bingo, and quizzes.
2. This individual score between 0-100% is then converted to the DTU 7-step grading scale.
3. After the group oral exam, each student may move up or down one grade step based on their individual performance.