

# MODELING THE PROCESS OF CALCULATING THE LOADS OF CONSTRUCTION OBJECTS AND STRUCTURES USING ARTIFICIAL INTELLIGENCE METHODS

INTRODUCTION



## AI CAPABILITIES

ARTIFICIAL INTELLIGENCE CAN SIGNIFICANTLY IMPROVE THE EFFICIENCY AND ACCURACY OF LOAD MODELING IN CONSTRUCTION

- PROCESSING OF LARGE VOLUMES OF DATA
- PREDICTION ACCURACY
- AUTOMATION
- ADAPTIVE LEARNING
- DESIGN OPTIMIZATION

# SIMULATION OF LOADS OF CONSTRUCTION OBJECTS

## THE PROCESS

- UNDERSTANDING THE CHARACTERISTICS OF THE CONSTRUCTION OBJECTS
- ASSESSMENT OF EXTERNAL FACTORS
- DETERMINATION OF TYPES OF LOADS
- USE OF MATHEMATICAL MODELS TO CALCULATE LOADS
- MODEL VERIFICATION AND VALIDATION

## CHALLENGES

- VOLUME AND COMPLEXITY OF DATA
- THE UNPREDICTABILITY OF THE REAL WORLD
- THE NEED FOR SPECIALIZED KNOWLEDGE AND SKILLS
- ISSUES IN MODELING AND CALCULATIONS
- COMPLIANCE WITH NORMS AND STANDARDS



# APPLICATION OF AI FOR LOAD MODELING

POTENTIAL

- SPEED
- ACCURACY
- ABILITY TO LEARN AND ADAPT

# APPLICATION OF AI FOR LOAD MODELING

## METHODS

- MACHINE LEARNING
- DEEP LEARNING
- REINFORCEMENT LEARNING
- EVOLUTIONARY ALGORITHMS
- HYBRID SYSTEMS



## A PRACTICAL EXAMPLE

“PROJECT REFINERY” BY AUTODESK

- “PROJECT REFINERY” (DEVELOPED BY AUTODESK) USES EVOLUTIONARY ALGORITHMS TO OPTIMIZE BUILDING DESIGN.
- THIS TOOL ALLOWS ARCHITECTS AND ENGINEERS TO ENTER DESIGN CRITERIA (SUCH AS PEAK LOAD, ENERGY EFFICIENCY, COST, ETC.) AND THEN AUTOMATICALLY GENERATE OPTIMAL DESIGN OPTIONS THAT MEET THOSE CRITERIA.
- THIS PROCESS INVOLVES MODELING DIFFERENT TYPES OF LOADS ON THE BUILDING, INCLUDING THE WEIGHT OF MATERIALS AND LOADS FROM WIND, SNOW, AND OTHER FACTORS. ARTIFICIAL INTELLIGENCE IS USED TO AUTOMATE THIS PROCESS AND FIND THE BEST SOLUTIONS.
- THIS APPROACH NOT ONLY HELPS TO FIND MORE EFFICIENT AND SAFER DESIGNS BUT CAN ALSO SIGNIFICANTLY REDUCE TIME FOR DESIGN AND CONSTRUCTION COSTS AS IT ALLOWS FOR THE AUTOMATION OF MANY TIME-CONSUMING PROCESSES.



## CONCLUSIONS

FUTURE RESEARCH

DETERMINING THE POSSIBILITIES OF USING AI IN VARIOUS ASPECTS OF CONSTRUCTION AND DEVELOPING NEW METHODS OF INTEGRATING AI INTO THE DESIGN AND CONSTRUCTION PROCESSES