Well-Defined Human Reasoning Approaches

1. Deductive Reasoning

Origin: Ancient Greece, formalized by Aristotle (384-322 BCE)

Explanation: Deductive reasoning starts with a general statement or hypothesis and examines the possibilities to reach a specific, logical conclusion. The conclusion is derived from the given premises and must be true if the premises are true.

Synonyms: Logical reasoning, top-down reasoning

Tasks for LLMs:

- Solving logic puzzles
- Debugging code
- Analyzing arguments for validity
- Making predictions based on given rules

Example prompt: "Using deductive reasoning, determine if the conclusion 'Socrates is mortal' is valid based on the premises 'All men are mortal' and 'Socrates is a man'."

2. Inductive Reasoning

Origin: Ancient Greece, developed by philosophers like Aristotle

Explanation: Inductive reasoning makes broad generalizations from specific observations. It involves moving from specific instances to a general conclusion, which is likely but not certain.

Synonyms: Bottom-up reasoning, empirical reasoning

Tasks for LLMs:

- Pattern recognition
- Trend analysis
- Making predictions based on historical data
- Forming hypotheses from observations

Example prompt: "Based on the following weather data for the past week, use inductive reasoning to predict tomorrow's weather."

3. Abductive Reasoning

Origin: Introduced by Charles Sanders Peirce in the late 19th century

Explanation: Abductive reasoning starts with an observation or set of observations and seeks to find the simplest and most likely explanation. It's often described as "inference to the best explanation."

Synonyms: Inference to the best explanation, retroductive reasoning

Tasks for LLMs:

- Diagnostic problem-solving
- Criminal investigations
- Scientific hypothesis formation
- Troubleshooting technical issues

Example prompt: "Given the symptoms of fever, cough, and fatigue, use abductive reasoning to suggest the most likely diagnosis."

4. Critical Thinking

Origin: Rooted in ancient Greek philosophy, particularly in the Socratic method

Explanation: Critical thinking involves objectively analyzing and evaluating an issue to form a judgment. It includes skills such as analysis, interpretation, inference, explanation, and self-regulation.

Synonyms: Analytical thinking, logical thinking, higher-order thinking

Tasks for LLMs:

- Evaluating arguments
- Fact-checking
- Identifying biases and fallacies
- Solving complex problems

Example prompt: "Critically analyze the following argument for and against implementing a universal basic income, identifying any logical fallacies or biases."

5. Systems Thinking

Origin: Developed in the 20th century, popularized by biologist Ludwig von Bertalanffy

Explanation: Systems thinking is an approach to analysis that focuses on how different parts of a system interrelate and how systems work over time and within the context of larger systems.

Synonyms: Holistic thinking, integrative thinking

Tasks for LLMs:

- Analyzing complex organizational structures
- Environmental impact assessments
- Predicting market trends
- Designing sustainable solutions

Example prompt: "Using systems thinking, analyze the potential long-term effects of implementing a four-day work week on a company's productivity, employee satisfaction, and overall economic impact."

6. Analogical Reasoning

Origin: Used throughout history, formalized in cognitive science in the 20th century

Explanation: Analogical reasoning involves drawing parallels between different situations or domains to solve problems or explain concepts. It relies on identifying similarities between known and unknown situations.

Synonyms: Comparative thinking, metaphorical thinking

Tasks for LLMs:

- Problem-solving in unfamiliar domains
- Explaining complex concepts
- Creative ideation
- Cross-domain knowledge transfer

Example prompt: "Use analogical reasoning to explain how the structure of an atom is similar to the solar system, and how this analogy might be useful or limited."

7. Counterfactual Thinking

Origin: Developed in psychology and philosophy in the late 20th century

Explanation: Counterfactual thinking involves imagining alternatives to past events, often in the form of "what if" scenarios. It's used to explore causality and alternative outcomes.

Synonyms: Hypothetical thinking, alternative scenario analysis

Tasks for LLMs:

- Historical analysis
- Decision-making simulations
- Risk assessment
- Ethical dilemma resolution

Example prompt: "Using counterfactual thinking, explore how World War II might have unfolded differently if the United States had not entered the war."

8. Lateral Thinking

Origin: Coined by Edward de Bono in 1967

Explanation: Lateral thinking involves solving problems through an indirect and creative approach, using reasoning that is not immediately obvious and

involving ideas that may not be obtainable by using only traditional step-by-step logic.

Synonyms: Creative thinking, divergent thinking

Tasks for LLMs:

- Generating innovative solutions
- Brainstorming
- Overcoming mental blocks
- Reframing problems

Example prompt: "Use lateral thinking to come up with five unconventional ways to reduce traffic congestion in a busy city without building new roads."

9. Probabilistic Reasoning

Origin: Developed in mathematics and statistics, with roots in the 17th century work of Blaise Pascal and Pierre de Fermat

Explanation: Probabilistic reasoning involves drawing conclusions based on the likelihood of various outcomes. It deals with uncertainty and uses probability theory to make predictions or decisions.

Synonyms: Statistical reasoning, Bayesian reasoning

Tasks for LLMs:

- Risk analysis
- Weather forecasting
- Medical diagnosis
- Financial modeling

Example prompt: "Using probabilistic reasoning, estimate the likelihood of a project being completed on time given the following data on past project completion rates and current project status."

10. Dialectical Reasoning

Origin: Ancient Greece, developed by philosophers like Plato and Hegel

Explanation: Dialectical reasoning involves examining and discussing opposing ideas to find truth through reasoned arguments. It often follows a thesis-antithesis-synthesis structure.

Synonyms: Dialogic reasoning, synthetic reasoning

Tasks for LLMs:

- Debate preparation
- Policy analysis
- Conflict resolution

- Philosophical inquiry

Example prompt: "Use dialectical reasoning to explore the pros and cons of social media use, and synthesize a balanced conclusion about its overall impact on society."

11. Algorithmic Thinking

Origin: Rooted in mathematics and computer science, formalized in the 20th century

Explanation: Algorithmic thinking involves creating a step-by-step procedure to solve a problem or accomplish a task. It focuses on defining clear inputs, outputs, and the precise steps to transform input into output.

Synonyms: Computational thinking, procedural thinking

Tasks for LLMs:

- Designing efficient processes
- Creating coding solutions
- Automating tasks
- Breaking down complex problems

Example prompt: "Using algorithmic thinking, describe a step-by-step process for efficiently packing a suitcase for a week-long trip."

12. Spatial Reasoning

Origin: Developed in cognitive psychology and neuroscience in the 20th century

Explanation: Spatial reasoning involves visualizing and manipulating objects and their spatial relationships in one's mind. It includes skills like mental rotation, spatial perception, and spatial visualization.

Synonyms: Visual-spatial thinking, geometric reasoning

Tasks for LLMs:

- Describing architectural designs
- Giving directions
- Solving geometric problems
- Explaining physical processes

Example prompt: "Use spatial reasoning to describe how to efficiently arrange furniture in a small studio apartment to maximize space and functionality."

13. Temporal Reasoning

Origin: Developed in various fields including philosophy, linguistics, and artificial intelligence

Explanation: Temporal reasoning involves understanding and reasoning about time-related concepts, sequences of events, and cause-effect relationships over time.

Synonyms: Time-based reasoning, chronological thinking

Tasks for LLMs:

- Scheduling optimization
- Historical analysis
- Project planning
- Predicting future trends

Example prompt: "Apply temporal reasoning to analyze the potential long-term effects of current climate change mitigation efforts over the next 50 years."

14. Causal Reasoning

Origin: Philosophical roots in ancient Greece, formalized in statistics and psychology in the 20th century

Explanation: Causal reasoning involves identifying and understanding cause-effect relationships. It goes beyond correlation to determine if one event or condition directly influences another.

Synonyms: Cause-effect analysis, etiological reasoning

Tasks for LLMs:

- Root cause analysis
- Scientific hypothesis testing
- Policy impact assessment
- Troubleshooting complex systems

Example prompt: "Use causal reasoning to analyze the potential causes of a sudden increase in employee turnover at a company, considering both internal and external factors."

15. Heuristic Reasoning

Origin: Developed in psychology and artificial intelligence in the mid-20th century

Explanation: Heuristic reasoning involves using mental shortcuts or rules of thumb to make quick decisions or judgments, especially in complex or uncertain situations. It's often efficient but can sometimes lead to biases.

Synonyms: Rule of thumb thinking, cognitive shortcuts

Tasks for LLMs:

- Quick decision-making

- Problem-solving under time constraints
- Simplifying complex issues
- Generating initial hypotheses

Example prompt: "Apply heuristic reasoning to suggest three quick methods for estimating the number of people in a large crowd at a public event."

16. Metacognitive Reasoning

Origin: Concept developed in psychology and education in the late 20th century

Explanation: Metacognitive reasoning involves thinking about one's own thought processes. It includes planning, monitoring, and evaluating one's cognitive strategies and learning processes.

Synonyms: Self-reflective thinking, thinking about thinking

Tasks for LLMs:

- Improving learning strategies
- Enhancing problem-solving approaches
- Self-evaluation of reasoning processes
- Developing critical thinking skills

Example prompt: "Use metacognitive reasoning to analyze and improve your approach to solving complex mathematical problems."

17. Ethical Reasoning

Origin: Rooted in ancient philosophical traditions, formalized in moral philosophy

Explanation: Ethical reasoning involves applying moral principles to make decisions about right and wrong. It considers the implications of actions on various stakeholders and evaluates them against ethical frameworks.

Synonyms: Moral reasoning, values-based thinking

Tasks for LLMs:

- Analyzing ethical dilemmas
- Developing corporate ethics policies
- Evaluating the moral implications of new technologies
- Resolving conflicts of interest

Example prompt: "Apply ethical reasoning to evaluate the pros and cons of implementing a universal basic income, considering various ethical frameworks and stakeholder perspectives."

18. Strategic Thinking

Origin: Developed in military theory and business management in the 20th century

Explanation: Strategic thinking involves planning and decision-making with a long-term perspective. It focuses on identifying goals, anticipating challenges, and devising comprehensive plans to achieve objectives.

Synonyms: Long-term planning, visionary thinking

Tasks for LLMs:

- Business strategy development
- Political campaign planning
- Resource allocation optimization
- Competitive analysis

Example prompt: "Use strategic thinking to develop a five-year plan for a small tech startup to compete with established industry giants."

19. Divergent Thinking

Origin: Concept developed in psychology and creativity research in the mid-20th century

Explanation: Divergent thinking involves generating creative ideas by exploring many possible solutions. It's characterized by fluency, flexibility, originality, and elaboration in idea generation.

Synonyms: Creative thinking, brainstorming

Tasks for LLMs:

- Brainstorming sessions
- Product ideation
- Problem-solving in novel situations
- Generating multiple storylines or plot ideas

Example prompt: "Apply divergent thinking to generate 10 unconventional uses for a common household item like a paper clip."

20. Convergent Thinking

Origin: Concept developed in psychology alongside divergent thinking in the mid-20th century

Explanation: Convergent thinking involves analyzing a set of facts or ideas to arrive at a single, best solution or answer. It focuses on speed, accuracy, and logic in finding the correct solution to a well-defined problem.

Synonyms: Analytical thinking, logical problem-solving

Tasks for LLMs:

- Solving mathematical problems
- Making decisions with clear criteria
- Identifying the most efficient solution
- Fact-checking and verification

Example prompt: "Use convergent thinking to determine the most cost-effective transportation method for a company, given specific data on distances, fuel costs, and time constraints."

21. Fuzzy Logic

Origin: Introduced by Lotfi Zadeh in 1965

Explanation: Fuzzy logic is a form of many-valued logic that deals with reasoning based on "degrees of truth" rather than the usual "true or false" (1 or 0) Boolean logic. It allows for partial truths and uncertainties.

Synonyms: Multi-valued logic, approximate reasoning

Tasks for LLMs:

- Natural language processing
- Decision-making under uncertainty
- Control systems design
- Risk assessment

Example prompt: "Apply fuzzy logic to create a recommendation system for movie choices based on user preferences that aren't strictly defined (e.g., 'somewhat funny', 'fairly exciting')."

22. Bayesian Reasoning

Origin: Based on Bayes' theorem, developed by Thomas Bayes in the 18th century

Explanation: Bayesian reasoning involves updating the probability of a hypothesis as more evidence or information becomes available. It's a method of statistical inference that allows for the incorporation of prior knowledge.

Synonyms: Probabilistic inference, conditional probability reasoning

Tasks for LLMs:

- Predictive modeling
- Medical diagnosis
- Spam filtering
- Financial risk assessment

Example prompt: "Apply Bayesian reasoning to update the probability of a product launch being successful, given new market research data."

23. Formal Logic

Origin: Rooted in ancient Greek philosophy, further developed in mathematics and philosophy

Explanation: Formal logic involves the use of symbolic representations to determine the validity of arguments based on their structure rather than their content. It includes propositional logic and predicate logic.

Synonyms: Symbolic logic, mathematical logic

Tasks for LLMs:

- Evaluating argument validity
- Programming language design
- Automated reasoning systems
- Formal verification of systems

Example prompt: "Using formal logic, represent and evaluate the validity of the following argument: 'If it's raining, the ground is wet. The ground is wet. Therefore, it must be raining.' "

24. Intuitive Reasoning

Origin: Recognized throughout history, studied in psychology and decision-making theory

Explanation: Intuitive reasoning involves making judgments and decisions based on instinctive feelings rather than conscious reasoning. It often relies on pattern recognition and unconscious processing of information.

Synonyms: Gut feeling, instinctive thinking

Tasks for LLMs:

- Quick decision-making in complex situations
- Creative problem-solving
- Emotional intelligence tasks
- Pattern recognition in ambiguous data

Example prompt: "Simulate intuitive reasoning to provide a quick assessment of a job candidate based on a brief description, then explain the potential benefits and drawbacks of this approach."

25. Narrative Reasoning

Origin: Rooted in storytelling traditions, formalized in narrative psychology in the late 20th century

Explanation: Narrative reasoning involves understanding and creating meaning through stories. It focuses on how events and experiences are connected over time and how they shape understanding and decision-making.

Synonyms: Storytelling logic, experiential reasoning

Tasks for LLMs:

- Creating coherent storylines
- Analyzing personal or historical narratives
- Brand storytelling
- Explaining complex concepts through analogies

Example prompt: "Apply narrative reasoning to explain the concept of climate change, creating a story that connects various environmental events and their consequences over time."

26. Spatial-Temporal Reasoning

Origin: Developed in cognitive science and artificial intelligence in the late 20th century

Explanation: Spatial-temporal reasoning involves understanding and reasoning about objects and events in both space and time. It combines spatial reasoning with the ability to track changes and movements over time.

Synonyms: Spatio-temporal thinking, dynamic spatial reasoning

Tasks for LLMs:

- Traffic flow prediction
- Weather forecasting
- Robotic motion planning
- Video analysis and description

Example prompt: "Apply spatial-temporal reasoning to describe how a busy intersection might change throughout a typical day, considering traffic patterns, pedestrian movements, and potential events."

27. Emotional Reasoning

Origin: Recognized in psychology and cognitive science in the late 20th century

Explanation: Emotional reasoning involves using emotional responses and intuitions to guide decision-making and judgment. While often criticized in clinical psychology, it's recognized as an important component of social intelligence and decision-making in certain contexts.

Synonyms: Affective reasoning, gut-feeling-based thinking

Tasks for LLMs:

- Character development in storytelling
- Emotional intelligence simulations
- Consumer behavior analysis
- Conflict resolution scenarios

Example prompt: "Apply emotional reasoning to predict how different stakeholders might react to a company's decision to shift to a fully remote work model, considering various personality types and work preferences."

28. Pattern Recognition

Origin: Studied in psychology and artificial intelligence since the mid-20th century

Explanation: Pattern recognition involves identifying regularities, trends, or systematic arrangements in data, ideas, or situations. It's a fundamental cognitive process that underlies many forms of learning and problem-solving.

Synonyms: Trend identification, regularity detection

Tasks for LLMs:

- Data analysis and visualization
- Predictive modeling
- Image and speech recognition
- Behavioral analysis

Example prompt: "Use pattern recognition to analyze a company's sales data over the past five years and identify any recurring seasonal trends or long-term patterns."

29. Socratic Reasoning

Origin: Ancient Greece, developed by Socrates and documented by Plato

Explanation: Socratic reasoning involves asking and answering questions to stimulate critical thinking and illuminate ideas. It often involves breaking down complex ideas into simpler components and examining underlying assumptions.

Synonyms: Elenctic method, maieutic reasoning

Tasks for LLMs:

- Teaching and tutoring
- Problem analysis
- Philosophical discussions
- Self-reflection exercises

Example prompt: "Apply Socratic reasoning to explore the concept of justice, asking and answering a series of probing questions to deepen understanding and challenge assumptions."

30. Constraint Satisfaction

Origin: Developed in artificial intelligence and operations research in the late 20th century

Explanation: Constraint satisfaction involves finding a solution to a set of constraints that impose conditions that the variables must satisfy. It's often used in scheduling, configuration, and optimization problems.

Synonyms: Constraint-based reasoning, constraint programming

Tasks for LLMs:

- Resource allocation
- Scheduling optimization
- Game solving (e.g., Sudoku)
- Configuration problems

Example prompt: "Use constraint satisfaction to create an optimal class schedule for a high school, considering teacher availability, room constraints, and student course selections."

31. Embodied Cognition

Origin: Emerged in cognitive science and philosophy in the late 20th century

Explanation: Embodied cognition posits that many features of cognition are shaped by aspects of the entire body. It emphasizes the role of the body's interactions with the environment in cognitive processes.

Synonyms: Enacted cognition, situated cognition

Tasks for LLMs:

- Human-computer interaction design
- Virtual reality experience creation
- Robotic system design
- Sensory-based problem solving

Example prompt: "Use principles of embodied cognition to design a more intuitive and engaging user interface for a smartphone app, considering how users physically interact with their devices."

32. Analogical Problem Solving

Origin: Studied in cognitive psychology since the mid-20th century

Explanation: Analogical problem solving involves using solutions from similar past problems to solve new problems. It requires identifying relevant similarities between the known and unknown situations.

Synonyms: Case-based reasoning, exemplar-based problem solving

Tasks for LLMs:

- Troubleshooting technical issues
- Legal case analysis

- Design inspiration
- Scientific discovery

Example prompt: "Use analogical problem solving to suggest ways a small business might adapt its operations during a pandemic, based on how businesses adapted during past economic crises."

33. Modal Reasoning

Origin: Developed in philosophy and logic, with roots in ancient Greek philosophy

Explanation: Modal reasoning involves thinking about possibilities, necessities, and impossibilities. It deals with concepts like "could," "would," "should," and "must."

Synonyms: Possibility thinking, necessity-possibility reasoning

Tasks for LLMs:

- Scenario planning
- Ethical decision making
- Logical proof construction
- Policy analysis

Example prompt: "Apply modal reasoning to analyze the potential outcomes of implementing a universal basic income, considering what could, should, and must happen under various economic conditions."

34. Diagrammatic Reasoning

Origin: Studied in cognitive science and artificial intelligence since the late 20th century

Explanation: Diagrammatic reasoning involves using visual representations to understand and solve problems. It includes creating, interpreting, and manipulating diagrams, charts, and other visual aids.

Synonyms: Visual reasoning, graphical thinking

Tasks for LLMs:

- Process flow optimization
- Data visualization interpretation
- Circuit design
- Architectural planning

Example prompt: "Use diagrammatic reasoning to explain and optimize the customer journey for an e-commerce website, from initial visit to post-purchase follow-up."

35. Transductive Reasoning

Origin: Developed in machine learning and cognitive science in the late 20th century

Explanation: Transductive reasoning involves drawing inferences about specific cases based on both labeled and unlabeled data, rather than trying to infer a general rule. It's particularly useful when dealing with limited data.

Synonyms: Instance-based learning, case-based inference

Tasks for LLMs:

- Semi-supervised learning tasks
- Personalized recommendations
- Social network analysis
- Image classification with limited labels

Example prompt: "Apply transductive reasoning to predict a user's movie preferences based on their past ratings and the ratings of similar users, even for movies the user hasn't seen yet."

36. Defeasible Reasoning

Origin: Developed in philosophy and artificial intelligence in the late 20th century

Explanation: Defeasible reasoning involves drawing conclusions that are tentative and subject to revision in light of new evidence. It allows for reasoning with incomplete or uncertain information.

Synonyms: Non-monotonic reasoning, revisable inference

Tasks for LLMs:

- Legal argumentation
- Medical diagnosis
- Real-time decision making in dynamic environments
- Belief revision in AI systems

Example prompt: "Use defeasible reasoning to assess the guilt or innocence of a suspect in a criminal case, updating your conclusion as new evidence is presented."

37. Fuzzy Reasoning

Origin: Developed alongside fuzzy logic in the mid-20th century

Explanation: Fuzzy reasoning extends traditional reasoning methods to handle uncertain or imprecise information. It allows for degrees of truth rather than the traditional binary true/false values.

Synonyms: Approximate reasoning, soft computing

Tasks for LLMs:

- Decision making under uncertainty
- Natural language processing
- Control systems design
- Risk assessment

Example prompt: "Apply fuzzy reasoning to develop a customer satisfaction rating system that accounts for the inherent vagueness in customer feedback (e.g., 'somewhat satisfied', 'very good')."

38. Paraconsistent Reasoning

Origin: Developed in logic and philosophy in the mid-20th century

Explanation: Paraconsistent reasoning allows for reasoning with inconsistent information without trivializing the results. It's useful in situations where contradictions exist but meaningful conclusions still need to be drawn.

Synonyms: Inconsistency-tolerant reasoning, dialectical reasoning

Tasks for LLMs:

- Handling conflicting data in databases
- Belief revision in multi-agent systems
- Legal reasoning with conflicting testimonies
- Scientific reasoning with competing theories

Example prompt: "Use paraconsistent reasoning to analyze and summarize a set of customer reviews that contain contradictory opinions about a product."

39. Probabilistic Graphical Modeling

Origin: Developed in artificial intelligence and statistics in the late 20th century

Explanation: Probabilistic graphical modeling involves using graphs to represent and reason about complex probability distributions. It combines probability theory with graph theory to model and solve problems involving uncertainty.

Synonyms: Bayesian network reasoning, Markov random field inference

Tasks for LLMs:

- Medical diagnosis
- Financial risk assessment
- Natural language understanding
- Computer vision tasks

Example prompt: "Apply probabilistic graphical modeling to create a system that predicts the likelihood of various diseases based on a patient's symptoms, medical history, and genetic factors."

40. Quantum Reasoning

Origin: Emerging field based on quantum mechanics and cognitive science in the 21st century

Explanation: Quantum reasoning applies principles from quantum mechanics to model cognitive processes and decision-making. It attempts to explain phenomena that classical logic struggles with, such as contextuality and order effects in judgments.

Synonyms: Quantum cognition, quantum-like reasoning

Tasks for LLMs:

- Modeling context-dependent preferences
- Explaining cognitive biases
- Decision-making under uncertainty
- Modeling belief dynamics

Example prompt: "Use principles of quantum reasoning to model and explain how a person's political opinions might change depending on the order in which they receive different pieces of information."