Multilingual Physical Reasoning Dataset

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Abstract

We present a manually curated dataset in Marwari and Marathi, modeled after the Physical Interaction: Question Answering (PIQA) format. The dataset captures culturally grounded knowledge domains relevant to native speakers, with examples drawn from diverse everyday scenarios. Each item consists of a commonsense-style prompt paired with two candidate solutions, of which exactly one is correct. Solving these examples requires reasoning about physical processes, cultural practices, and daily-life phenomena. This resource is intended to enable robust evaluation of commonsense reasoning capabilities across languages.

1 Dataset Construction

1.1 Marwari

This dataset comprises **131 sentence pairs** in Marwari that test *physics-based commonsense* grounded in real life across the Thar/Marwar region. Prompts are natural, multi-sentence scenarios from home, kitchen, farm fields, and desert travel; two candidate completions differ subtly, with one physically correct and the other plausible but wrong.

Coverage

- **Daily life & objects:** Glass tumbler, clay pot or pitcher, iron door, copper water vessel, rope cot with loose middle rope, anklet, turban, rolling pin or sieve, rope and bucket at the well, iron gate, magnifying glass lens.
- **Weather & nature:** Bright sunlight, desert wind and storms, hot loo wind, sand dunes, monsoon rain, pond or well water, mud, shade versus sunlight, cold desert nights, puddles and evaporation, echoes in wells.
- **Farming & rural context:** Ploughing the field, sowing seeds, weeding, bullock carts and camel carts, field bunds, unpaved muddy roads, animal troughs, village hamlets and havelis, well pulleys with worn-out ropes, load sinking in desert sand.
- **Food & kitchen:** Millet flatbread on griddle, frying kachori, steaming dhokla, cooking on tava, kadai or tandoor, melting ghee, boiling milk and lentils, buttermilk in clay pots, snacks losing crispness due to moisture, chili tadka causing cough.
- **Physical processes:** Heating and cooling, evaporation and condensation, melting and freezing, friction and sinking, buoyancy, tension in ropes, resonance and echo, corrosion of copper patina, rusting of iron, Leidenfrost effect on hot griddles.
- **Safety & danger:** Touching hot tavas, steam burns from boiling milk, live electric wires, strong wind blowing out lamps, sharp kite strings cutting fingers, desert sandstorms affecting eyes, loose ropes breaking under heavy loads.
- **Cultural context:** Diwali lamps near windows, Holika bonfire with wet wood, camel safari and races, turbans protecting from sun, tying rakhi threads, traditional instruments like morchang, village drums and dhol-tasha.

Design Choices

- **Physical reasoning focus:** Heat transfer and cooling (e.g., iron doors in the sun, water staying cool in clay pots), state changes (melting ice, boiling milk), cause and effect (lamp blowing out in wind, cart wheels sinking in sand), and weight/motion/balance (pulling a cart on sand, bucket tension on ropes).
- **Variable length:** Prompts range from short colloquial setups to detailed multi-sentence

narratives, improving coverage and preventing models from learning stylistic shortcuts.

- **Culturally grounded:** Integrates rural Marwar routines (hamlets, wells, camel carts, tandoors, desert winds) to ensure that commonsense knowledge is realistic and meaningful to native speakers.
- **Prompts are descriptive:** Multi-sentence situations set time, place, materials, and actions, ensuring that correct answers depend on physical reasoning rather than phrasing patterns.
- **Reasoning emphasis:** Covers intuitive phenomena such as melting, heating, floating/sinking, weight lifting on sand, friction, echo, and corrosion—requiring true physical understanding.

All prompts use natural Marwari phrasing but are explained here in English for clarity.

1.2 Marathi

This dataset contains **135 sentence pairs** focusing on physics-based reasoning grounded in everyday Marathi life, rural contexts, and culturally significant events. Each prompt is a natural, multi-sentence scenario; two candidate completions differ by a small but meaningful physical detail. One completion is unambiguously correct; the other is plausible yet physically wrong. The set emphasizes **cause–effect** reasoning about objects, materials, weather, cooking, tools, and rural activities familiar to Marathi speakers.

Coverage

- **Daily life & objects:** Glasses/cups, pillows, clothes, umbrellas, locks/keys, shoes, fans, chairs/doors, utensils, buckets/ropes, bullock carts.
- **Weather & nature:** Rain, sun/heat, clouds, rivers, wells, muddy roads, storms, shade, thunder, cool air.
- **Farming & rural context:** Seeds, crops, fields, muddy tracks, wells, animal troughs, farm animals (cow, buffalo, bull), village houses.
- **Food & kitchen:** Roti, milk, curd, buttermilk, cooking oil, onions/spices/pulses, boiling milk, cooking on *chulha*, heating ghee.
- **Physical processes:** Heating/cooling, evaporation/condensation, melting/freezing, friction, floating/sinking, balance, motion, sound/echo, weight.
- **Safety & danger:** Hot stoves/boiling vessels, electricity, fire hazards, slipping floors, strong wind turning umbrellas inside out, punctures.
- **Culturally relevant context:** Mud houses, copper pots, turban/scarf, bangles, Indian monsoon scenarios.

Design Choices

- **Physical reasoning focus:** Heat transfer (hot/cold surfaces, cooling tea), state changes (melting ice, boiling water, condensation), cause and effect (rain forming puddles, umbrella turning inside out), and weight/motion/balance (bucket feels heavy, cart moves with bull power).
- **Variable length:** Prompts range from short, colloquial setups to full multi-sentence situational tasks, preventing overfitting to a single style and improving robustness.
- **Culturally grounded:** Integrates rural and urban Maharashtrian routines (e.g., *chulha*, wells, mud houses) so the commonsense remains meaningful for native speakers.
- **Prompts are descriptive:** Most are multi-sentence and set context (*"If a roti made in the morning is left out, by evening..."*).
- **Reasoning emphasis:** Melting, heating, floating, weight lifting, and cooling all require intuitive physics rather than surface cues.