



Mapping Lost Harbors: AI Applications in Understanding the Ancient Ports of Saurashtra

Alpa S. Nimavat

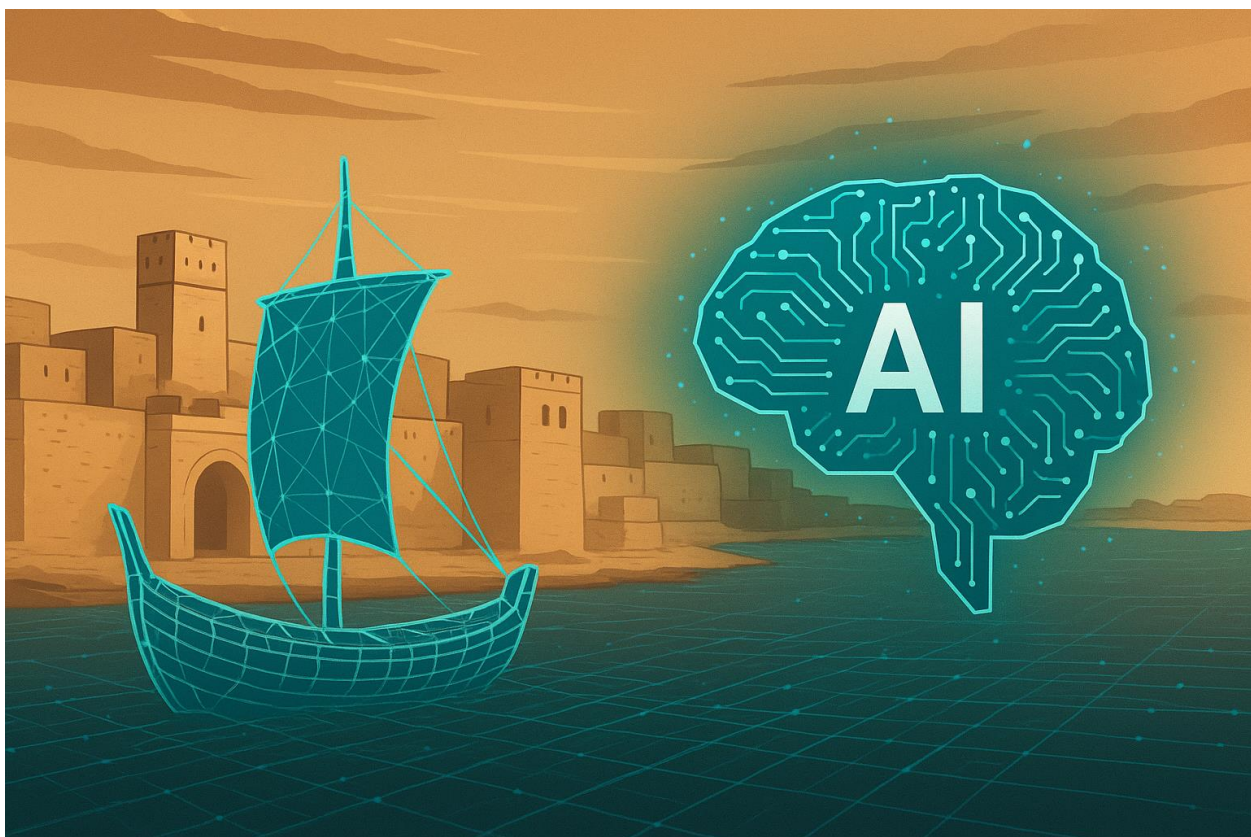
Under supervision of Vaidehi shrimali

Department of History

Sabarmati University, Ahmedabad.

alpayadav99@gmail.com

Mob. no:-9099024323



Mapping Lost Harbors: AI Applications in Understanding the Ancient Ports of Saurashtra

Abstract

The Saurashtra region of Gujarat possesses one of the richest maritime histories in the Indian subcontinent, reflected in its ancient ports such as Lothal, Dwarka, Bet Dwarka, Porbandar, Mangrol, Somnath–Veraval, Hathab, Vallabhi, and Ghogha. Literary records, archaeological findings, inscriptions, and coastal geomorphology reveal that Saurashtra maintained long-distance commercial and cultural connections with regions including Mesopotamia, Persia, Arabia, East Africa, Sri Lanka, Southeast Asia, and the Roman world. However, many ancient ports of Saurashtra are today either submerged, eroded, or geographically landlocked due to tectonic shifts, sedimentation, and coastline recession. These changes obscure the original maritime landscape and create challenges for reconstructing historical port networks.

The recent integration of Artificial Intelligence (AI) in archaeology and historical research offers transformative possibilities for understanding these ancient maritime systems. AI-assisted 3D modelling enables the digital reconstruction of dockyards, warehouses, jetties, and urban settlements at sites such as Lothal, Dwarka, and Bet Dwarka. Machine learning and computer vision enhance underwater archaeological studies by improving sonar image interpretation and identifying submerged anchors, jetty structures, and artefacts along the Saurashtra coastline. AI-based climate and ocean-current models recreate ancient trade routes, demonstrating how monsoon winds facilitated two-way navigation between Saurashtra and the wider Indian Ocean region. Natural Language Processing (NLP) aids in analysing inscriptions, copper plates, Jain literature, Arabic records, and Greco-Roman texts to extract information on ports, merchants, and commodities. AI-based artefact classification further clarifies the origins, chronology, and distribution of beads, ceramics, and anchors, thus refining trade-route interpretations.

In addition to historical research, AI promotes public engagement and heritage preservation through virtual museums, immersive simulations, and classroom visualizations that allow students to experience ancient ports interactively. This article argues that AI not only enriches historical understanding but also reconnects modern audiences with Saurashtra's maritime past, bridging gaps left by fragmented archaeological records and altered coastal landscapes.

Key words:- Maritime, Ports, Archaeology, Reconstruction, Underwater, Sonar, NLP, Trade, Dockyard, Lothal, Dwarka, Heritage

Introduction

The history of Saurashtra is inseparable from its maritime identity. Situated along the Arabian Sea and bordered by the Gulf of Khambhat and the Gulf of Kachchh, Saurashtra developed into a major centre of oceanic trade from the third millennium BCE onward. Archaeological discoveries at Lothal, Dwarka, Bet Dwarka, Vallabhi, Somnath–Veraval, Porbandar, Mangrol,



Volume - 2

and Ghogha confirm the existence of a complex port system that facilitated commerce, cultural exchange, and shipbuilding traditions. Texts such as the *Mahabharata*, *Harivamsa Purana*, *Arthashastra*, and *Periplus of the Erythraean Sea* complement this archaeological record, highlighting the region's connections with Mesopotamia, Persia, Arabia, East Africa, Sri Lanka, and China.

Yet, the maritime landscape of Saurashtra has undergone dramatic transformations. Geological uplift, river course changes, sediment deposition, and coastline recession have caused many ancient ports to become landlocked or submerged, complicating historical reconstruction. Traditional archaeological methods, though invaluable, are often insufficient for mapping such altered environments.

In recent years, Artificial Intelligence (AI) has emerged as a powerful tool in maritime archaeology and historical reconstruction. AI technologies—including machine learning, deep-learning-based image analysis, predictive GIS modelling, Natural Language Processing, and 3D virtual reconstruction—offer new ways to investigate ancient ports, analyse artefacts, map coastlines, and simulate trade routes. These tools enable scholars to “see” what no longer exists physically, providing a more holistic understanding of Saurashtra's maritime heritage. This article examines how AI enhances the study of Saurashtra's ancient ports by integrating technological insights with historical and archaeological evidence.

Historical over view of maritime heritage of Saurashtra, Gujarat.

Geography and Strategic Position

Saurashtra was situated at the meeting point of multiple significant transoceanic routes. Naturally occurring bays, estuaries, and peninsulas that were formerly utilized for shipbuilding, fishing, and anchoring make up its more than 800-kilometer coastline. Peninsulas are naturally oriented toward maritime development because they extend into maritime networks and provide easily accessible land routes. (Raikes, 2017)

Monsoon winds have made it possible to travel both ways between the ports of Saurashtra and places like Oman, Bahrain (Dilmun), and Mesopotamia since ancient times. The Arabian Sea is directly adjacent to Saurashtra.

Ancient ports and Civilization connection

Gujarat has approximately 1660 kilometres of coastline along the Arabian Sea, the Gulf of Khambhat (Cambay), and the Gulf of Kachchha in the west. The vast expanse of the Rann area in the north is unique in that it was submerged from around 9th BC to 15th AD and is now a dry salt-encrusted plain. Maritime trade expanded under the Kshatrapas and Guptas, and the Maitraka capital Vallabhi served as a notable port city, located close to the waters of the Gulf of Khambhat. Although Vallabhi now lies about 35 km inland, archaeological findings such as



Volume - 2

copper plates and an old buoy confirm its former coastal status. (S.Thakker, Raval, & Dasgupta, 2009) Gujarat has been inhabited for hundreds of thousands of years, and there are many traces of prehistoric life. Archaeologists have discovered the ruins of port towns from the third or second millennium BC, indicating that marine trade was prevalent at the time. Gujarat had trade relations with many countries back then. Gujarat's relations with other countries weakened as a result of the abandonment of Indus Valley Civilisation cities. Except for what can be learned from the artefacts they left behind, little is known about the people who lived in the past. Trade and navigation, both oceanic and riverine, increased dramatically during the Mauryan period, which lasted from 321 to 180 BC. The Arabian Sea was primarily used for maritime trade. Gujarat has been known for its navigation since antiquity, and it has established trade links with ancient countries such as Sumer, Phoenicia, Rome, Egypt, Arabia, Iran, East Africa, Lanka, Brahmadesh, Malaya, Java, Sumatra, and China. (S.Thakker, Raval, & Dasgupta, 2009)

Historical information about Gujarat ports can be found in the Mahabharat, Harivansh Purana, Bhagvat, and Matsya Purana. The Harivansh Purana mentions that the Yadavas' prosperity was due to sea trade. According to Kautilya's 'Arthashastra', the primary occupation of people living along the coast was navigation. Many of Gujarat's well-known ports are mentioned in ancient Greek and Roman literature. Galazy, a Greek author, wrote about the shipping of Kachchha in his book 'Batiyas'. Peryaksa, a Greek author, described the shipping of Kachchha around 246. The author of the ancient African book 'Tibu-tib' praised the strong Kachchhi vessels that used to sail to Africa in those days.

A book which was written after the Solanki period named 'Nabhi Nandan Jinoddhar Prabandh' mentions about Gujarat: "Residents of this region are small traders doing trade at ports and hence prosperous." (S.Thakker, Raval, & Dasgupta, 2009)

Major ancient ports of Saurashtra

Gujarat is considered to have had a longer coastline in ancient times. According to historical data, Gujarat had 84 ports during the medieval period. Even as late as 1842, from them province of Saurashtra had 62 ports. (S.Thakker, Raval, & Dasgupta, 2009) Like Kandla, Mandvi, Lothal, Dwarka, Bet dwarka, Mul Dwarka, Somnath-Veraval, Porbandar, Ghogha.

Lothal

Lothal is located in Saurashtra, Gujarat, between the Sabarmati River and its tributary Bhogavo. The sea is about 19 kilometres away today, but back then, boats from the Gulf of Cambay could easily sail right up to the place. Lothal, an early Harappan site, was excavated from 1953 to 1964. In his report, the first part of which was published in 1978, S R Rao describes the remains discovered there. It is divided into Lothal A and Lothal B; the former refers to the first four levels or zones associated with the Mature or Urban Harappan period, while the latter includes two levels or zones associated with the Late or Post Harappan period. The site dates to approximately 2100 BC. (Wadhwa, APRIL 2020)

Lothal is the missing link connecting Harappan settlements to Gujarat. Because no traces of Harappan 5 Civilization have been discovered north of Gujarat, it is assumed that people and goods travelled between the two locations via sea coast rather than overland routes. The existence of a dock in Lothal confirms this. The remnants of the port town. Lothal's dockyard is a trapezoid-shaped brick structure on the town's eastern side. It is discovered to be the largest burnt-brick structure in all Harappan settlements. Even the elite would have found it prohibitively expensive to construct elaborate structures with these burnt bricks. This construction suggest that the structure was very vital to the town. (Wadhwa, APRIL 2020)

65 terracotta seals were discovered in the warehouse in Lothal. The Harappan seals have been discovered in Mesopotamian sites including Kish, Lagash, Nippur, and Ur. However, no Mesopotamian seals have been found at Harappan sites. It appears that Mesopotamian traders did not directly engage in trade with the Harappans. A circular Persian Gulf seal discovered here suggests that the Persians served as trade intermediaries between Lothal and Mesopotamia. (S.R.Rao, 1979)

Kandla and Mandvi

Currently, Gujarat's coastline has approximately 38 ports. One of these is an important major port, Kandla in Kachchha district, while 11 are medium or second-grade ports and 26 are small ports. It is also mentioned in the literature that ships from 84 different ports from various countries with different flags on them used to visit Mandavi port in Kachchha before a century. (S.Thakker, Raval, & Dasgupta, 2009)

Gujarat also had a thriving wooden shipbuilding industry, especially at Mandvi, which significantly contributed to maritime ventures across the Indian Ocean. Evidence further shows that the Rann of Kachchh was once a gulf suitable for shipping, with vessels navigating the region until at least the 7th century CE. Maps indicate that during the 8th–6th centuries BCE, the area formed part of the Arabian Sea. (Shah, 2017)

Somnath-veraval

Somnath, also known as Prabhasa, is a sacred site with significant historical significance. The Mahabharata refers to it as Prabhasatirtha, and the Bhagata Purana states that the town is located on the coast and the Saraswati River flows westward at this hallowed location. Prabhasa is also mentioned in the Nahapana cave inscriptions at Nasik and Karle. Prabhasa was a thriving port in the prehistoric era and appears to have stretched all the way to Somnath. A warehouse that resembles the Tepe Yahya warehouse in West Asia was found on the bank of the River Hiran during inland excavations at Prabhasa. Six lingas were discovered during the near-shore exploration between Veraval and the River Hiran; some of these lingas are still revered. There were offshore explorations. (Dwivedi, 2023)



Volume - 2

Three seasons of underwater exploration off Somnath were conducted: 1991–1992, 1999–2000, and 2000–2001. The study area included sandy patches, a flat rocky seabed, and rocky outcrops. Six objects were produced in the first season, eight in the second, and twenty-one in the current 2001 season. The most ring stones were produced by Somnath. Thirty-five, or more than eighty percent, of the forty-three stone anchors found are of the ring-stone variety. The water was between 7 and 15 meters deep. The ring stone saw overgrown seaweeds below a depth of 8 meters. However, a layer of greyish marine growth is present in ring stones from deeper depths. The ring stones have been categorized into three groups based on their shapes and raw materials. Every ring stone found in the regions indicates that their shapes are strikingly similar to one another. The raw material and size, however, differed. (A.S. GAUR*, 2004)

The temple is situated at such a place that there is no land in a straight line between Somnath seashore until [Antarctica](#), such an inscription in [Sanskrit](#) is found on the *Bāṇastambha* (Sanskrit: बाणस्तम्भ, lit. *arrow pillar*) erected on the sea-protection wall. According to the *Bāṇastambha*, it is located at the northernmost point on the Indian landmass from the South Pole at that longitude. (Reconstruction, 1950)

Dwarka

Dwarka is located on the Arabian Sea coast in the Okhamandal taluka of the Jamnagar district in Gujarat state, far west of the Saurashtra peninsula. The Okha Rann divides the Okhamandal region from the rest of Saurashtra. The unquestionable antiquity of the early historical period, dating to the second century BC, was revealed by onshore excavations at Dwarka. Since 1983, the Marine Archaeology Centre of the National Institute of Oceanography has conducted offshore explorations in Dwarka waters, revealing several structures and anchors in water depths ranging from three to fifteen meters. Rocky cliffs, sandy areas, and submerged river channels are examples of Dwarka's sea floor. Dwarka's offshore features point to a mild slope. Archaeological artefacts have been discovered partially buried in sediments or recovered close to the rocky cliffs. Up to an 8 m water depth, a thick layer of vegetation has grown over the artefacts. During fair weather, visibility is excellent for explorations and photography. (A.S. GAUR*, 2004)

These stone structures thus bear witness to the fact that they were a part of a jetty that may have collapsed over time. Additionally noted were the various types and sizes of historical and medieval stone anchors. In relation to these discoveries, Sayajirao Gaekwad of Baroda had constructed a dock and landing area along the Gomati Creek, as well as massive stone pillars on the opposite side to make ship tying easier. The remnants of Sayajirao Gaekwad's buildings may be the stone structures found during the maritime archaeological survey. However, no pottery, artefacts, or habitational remnants from the protohistoric era (3500 years BP) have been found in Dwarka's nearshore or offshore regions thus far. (Tripathi)

Bet dwarka



Volume - 2

Lord Krishna is connected to Bet Dwarka Island, also known as Bet Shankhodhar. It is located approximately 30 kilometres north of Dwarka at the mouth of the Gulf of Kachchh, and local boats can travel there from Okha port. Ptolemy and Periplus Maris Erythraei both referred to Bet Dwarka as Barake in the Gulf of Kanthi, which is most likely the Gulf of Kachchh. Bet Dwarka Island has also been the site of onshore and offshore explorations. The results verify that Bet Dwarka was inhabited by humans from the protohistoric era (4000 years BP) until the present. Stone structures and ceramics were discovered during excavations along the island's coast. and bangles made of shells. Additionally, during onshore exploration, historical and medieval pottery, Kushana and Mughal coins, and iron guns were discovered. Near Khuda Dargha, where historical period remnants were discovered, shifting of the shoreline was noted during exploration. At high tide, these remnants submerge. This implies that the shoreline in this area changed during the Christian era. Many stone anchors, including composite, Indo-Arabian, and ring stones, amphorae sherds, lead ingot lead anchors, and stone artefacts between 5 and 8 m water depth, were discovered during offshore explorations closer to the current Bet Dwarka jetty. Roman contacts with Bet Dwarka are indicated by the amphorae sherds, lead anchors, lead ingots, and stone artefacts. (Tripathi)

Mul Dwarka

In order to find evidence of maritime activity, extensive underwater explorations were conducted between 4 and 8 meters below the surface off Miyani and Visawada. Several Indo-Arabian, composite (triangular), and single-hole stone anchors were found off the coast of Miyani and Visawada. These stone anchors may be dated between the historical and medieval periods, according to comparative analyses. The discovery of stone anchors from these locations indicates that sailors favoured the mouths of creeks and protected bays along the coastline as secure anchoring locations because stone anchors are indicative of the presence of ancient harbours, anchorage points, and trade routes. Investigations near Mul Dwarka (Kodinar) on the coast of Saurashtra brought to in the intertidal zone, light a composite anchor. The anchor is made of sedimentary rock having an upper circular hole and two square lower holes. The anchor resembles other composite anchors recovered from other sites of Gujarat. (Tripathi)

Also a circular structure of 4 meter constructed near temple with limestone, locally called divadandi(light house) if it is, then it's an oldest remain of light house in the saurashtra region. (CSIR-National Institute of Oceanography, n.d.)

Ghogha

Gogha, situated on the mid-western coast of the Gulf of Khambhat in Bhavnagar district, has a long maritime history. The Gujarati proverb "*Lankani lari ane Ghoghano var*" suggests ancient overseas links with Sri Lanka. Archaeological and literary evidence also highlight its significance: Jain temples from the 10th–11th centuries indicate its role as a religious center, and an Arabic inscription dated 1170 CE further confirms its early importance. Explorations during

low tide revealed numerous stone anchors—mainly Indo-Arab types—located 100–200 meters from the high-tide line, showing that large boats anchored here during high tide. Finds also include unfinished anchors and medieval Islamic glazed ware, comparable to material dated between the 14th–16th centuries at other sites in Khambhat. These discoveries together demonstrate Gogha’s active participation in regional and overseas maritime trade. (Gaur A. S., (2011).)

Mangrol

Mangrol, located on the south-western coast of the Saurashtra region in Gujarat, has historically been an important fishing and maritime settlement. Its natural harbour, situated along a sheltered creek, made it suitable for anchoring vessels and facilitating coastal trade. Historical references suggest that Mangrol was part of the wider maritime network that connected Saurashtra with ports of the Arabian Peninsula and East Africa. The town is traditionally associated with shipbuilding, fishing communities, and artisanal maritime crafts, reflecting a long-standing coastal culture. Archaeological observations in the region have revealed remnants of ancient structures, pottery, and maritime-related artefacts that point toward sustained seafaring activity. During the medieval period, Mangrol functioned as a regional port for local trade in textiles, salt, grains, and marine products. Its continued relevance into the colonial period further illustrates its strategic coastal position. Even today, Mangrol remains a major fishing port of Gujarat, maintaining its historical legacy as a centre of maritime livelihood and coastal culture.

Antroli is a small village located about 10 km east of Madhavpur and half a kilometre from the Porbandar–Bhavnagar highway. Around 1 km further east stands a renovated 11th–12th century temple that preserves several ancient sculptures, including images of Shiva–Parvati, Vishnu, and other deities. The temple’s original plinth, coated with lime wash, is still intact. About 200 metres south of the temple lies an elevated limestone ridge that once acted as a natural barrier between the land and the sea. Surface exploration in this area revealed the remains of a protohistoric settlement spread over roughly 100 × 100 metres, much of which is now agricultural land. At one location, archaeological deposits nearly 1 metre deep were observed, containing materials from both protohistoric and medieval periods. The pottery resembles finds from Bet Dwarka, Bhokhira, Kaj, and Kanjetar. (Gaur A. S., (2013).)

An early medieval mound is also present south of this settlement. Today, the coastline lies about 1 km away, with large sand dunes protecting the area from tidal impact. Numerous marine shells found during exploration indicate active use of nearby coastal resources in ancient times. (Tripathi, Investigations at Antroli: A late Harappan site and maritime archaeological, 2012)

Porbandar-Navibandar

Porbandar, located on the central-western coast of Saurashtra, is one of the region’s most historically significant port towns. Archaeological and literary evidence indicate that Porbandar served as an important maritime hub from early historic times through the medieval period. The

proximity of coastal settlements such as Bokhira—where protohistoric and early historic artefacts have been discovered—supports the idea that Porbandar was embedded in an active coastal trade network. Its natural harbour, protected by rocky formations, facilitated safe anchorage and enabled commercial links with ports across the Arabian Sea. (Tripathi, Investigations at Antroli: A late Harappan site and maritime archaeological, 2012)

During the medieval period, Porbandar and Mangrol emerged as major maritime centres on the Saurashtra coast, while nearby Navibandar functioned as an auxiliary port for transporting goods inland. The presence of stone anchors, ancient jetties, and well-planned stone-paved roads around Navibandar indicates a sophisticated coastal transportation system that supported Porbandar's trading activities. Historical accounts suggest that ships from Porbandar engaged in regional and long-distance trade, dealing in textiles, grains, timber, and marine products.

Porbandar's maritime importance continued into the princely state period, and its archaeological landscape—comprising ancient coastal mounds, jetties, and reused cannons—reflects a long, continuous tradition of seafaring that shaped the cultural and economic history of Saurashtra. (Gaur A. S., (2013).)

Discussion

Ancient texts, archaeological evidence, and traditional Gujarati sayings all point toward the existence of prosperous ports in regions of Gujarat that are now completely landlocked. Although scientific studies often emphasize sea-level rise causing the submergence of old settlements, the situation in Gujarat appears different. Here, at many locations, the coastline has receded, leaving former port towns far inland. Examples include Tamralipti on the eastern coast and numerous sites in western India and Gujarat—such as Vallabhi, Gundi-Koliak, Hathab, Kathivadar, Sonrai, Rander, Vartej, Khakhrechi, Vavania, Kuntasi, Desalpur-Guntaligadh, Benap, Padan, Tharad, Mavsari, Bhadreswar, Rayan, Khari Rohar, Nagara, Modhera, Zinzuwada, Kodadha, Amarapur, and Kamboi.

The existence of these inland ports makes the study of buried and forgotten harbours an intriguing aspect of India's maritime history. Modern remote-sensing technologies are especially valuable in this regard, providing both initial clues and confirmatory data about locations of ancient ports mentioned in historical sources. By mapping the shifts in coastline and landscape over time, remote sensing helps reconstruct past environments and offers new insights into cultural history that are otherwise inaccessible today. (S.Thakker, Raval, & Dasgupta, 2009)

AI use in understanding History of ancient port of Saurashtra

Many ports in Saurashtra, including Dwarka, Bet Dwarka, Hathab, Vallabhi, Porbandar, and Ghogha, are either landlocked or submerged today. Artificial intelligence offers powerful tools for studying the region's ancient maritime history. AI aids in the reconstruction of lost coastal

landscapes, the analysis of archaeological discoveries, and the comprehension of prehistoric navigation and trade systems. (Orengo, 2019)

AI-Based 3D Reconstruction

AI uses archaeological measurements, old maps, and coastal data to create digital models of historic dockyards, warehouses, jetties, and ships. Scholars and students can see how ports like Lothal and Dwarka operated in the past thanks to virtual reconstructions.

AI in Underwater Archaeology

Sonar and underwater photo interpretation is enhanced by deep learning. At Dwarka, Bet Dwarka, and Ghogha, it assists in finding submerged structures, stone anchors, and harbour remnants with great. (Pantanowitz, 2020)

AI for Trade Route Simulation

Ancient sea routes connecting Saurashtra with Oman, Bahrain, Mesopotamia, Sri Lanka, and East Africa are predicted by machine learning using wind patterns, monsoon data, and ocean currents.

NLP for Ancient text

From inscriptions, copper plates, Jain-Arabic inscriptions, and classical works such as the Periplus, Natural Language Processing extracts information about ports, goods, ships, and merchants.

AI in Artefact Classification

Beads, ceramics, and anchors are automatically recognized by AI, which aids in determining their provenance and commercial relationships. This makes it clear whether the products originated from Islamic, Persian, Roman, or Harappan networks. (Menze, 2006)

Immersive Education Tools

Students can "visit" historic ports, stroll through rebuilt dockyards, and virtually experience historical maritime life thanks to AI's support for virtual museums and classroom simulations. (Sylaïou, 2010).

Conclusion

The ancient ports of Saurashtra represent a remarkable maritime tradition extending from the Harappan era to the medieval period. These ports once linked Gujarat to major civilizations



Volume - 2

across the Indian Ocean, supporting vibrant trade in beads, ceramics, shells, textiles, metals, and marine products. Over centuries, however, shifting coastlines, tectonic activity, erosion, and sedimentation altered the region's geography, leaving many historic ports submerged or inland. As a result, understanding Saurashtra's maritime history requires methods capable of reconstructing lost landscapes and interpreting scattered archaeological data.

Artificial Intelligence provides precisely such a capability. AI-based 3D reconstructions recreate dockyards and settlements with remarkable accuracy; sonar-enhanced deep learning identifies submerged anchors and harbour structures; trade-route simulations integrate climate and oceanographic data; NLP extracts meaningful patterns from inscriptions and ancient literature; and AI-powered artefact classification refines chronological and cultural interpretations. Beyond research, virtual museums and immersive educational tools bring Saurashtra's maritime past to students and the public, allowing them to experience historic ports in lifelike digital environments.

Together, these technologies bridge critical gaps in historical knowledge and illuminate aspects of Saurashtra's maritime heritage that would otherwise remain hidden. AI does not replace archaeology but strengthens it, providing interdisciplinary pathways to preserve, reconstruct, and interpret Gujarat's coastal history for future generations.

References

- A.S. GAUR*, S. S. (2004). 'Saurashtra Stone Anchors' (Ring-stones) from Dwarka and Somnath West cost of India. *The mariene "s mirror*.
- CSIR-National Institue of Ocenography. (n.d.).
- Dwivedi, M. (2023). 7 Liminalities and Centralities of Early Historic Ports: The Gulf of Khambhat in Perspective. In *Handbook of Ancient Afro-Eurasian Economies: Volume 3: Frontier-Zone Processes and Transimperial Exchange*.
- Gaur, A. S. ((2013).). Ancient coastal transportation system along the Western Saurashtra coast: evidence from Navibandar. . 190-193.
- Gaur, A. S. ((2011).). Ancient anchorage systems in India with reference to the Gujarat coast. *Darshak Itihas Nidhi*.
- Menze, B. U. (2006). Detection of ancient settlement mounds using remote sensing. *Proceedings of the National Academy of Sciences*.
- Orengo, H. A.-M. (2019). A machine-learning approach to archaeological analysis using remote sensing datasets. . *Journal of Archaeological Science*,, 105, 1–10.



Volume - 2

- Pantanowitz, M. (2020). Deep learning for sonar image classification. . *Journal of Marine Science and Engineering*, 650–661.
- Raikes, A. (2017). Coastal landscapes and ancient seafaring. *Journal of Maritime History*, 29(2), 147–165.
- Reconstruction, s. t. (1950). *Dharmapedia*.
- S.R.Rao. (1979). Lothal: A Harappan Port Town (1955-62), Vol 1. . *Archaeological Survey of India*, .
- S.Thakker, P., Raval, M. H., & Dasgupta, A. R. (2009). Ancient ports of Gujarat. *Geospatial World*.
- Shah, A. (2017). "Mandvi - Once Upon a Port. *Live History India*.
- Sylaiou, S. M. (2010). Exploring virtual museums: AI-based heritage visualization. *Computers & Graphics*, , 34(2), 129–138.
- Tripathi, S. (n.d.). An overview of maritime archaeological study in India. In *maritime contact of the past*. CSIR-National Institute of Oceanography, Goa,.
- Tripathi, A. G. (2012). Investigations at Antroli: A late Harappan site and maritime archaeological. *Man Environ.*, vol.37(2); 2012; 41-49.
- Tripathi, A. G. (2012). Investigations at Antroli: A late Harappan site and maritime archaeological. *CSIR-National Institute of Oceanography*.
- Wadhwa, D. S. (APRIL 2020). LOTHAL: INDIA'S FIRST ICONIC MARITIME SITE. *SAGARDHARA* .



Shree Naroda Kelavani Mandal Sanchalit

SMT. A.P. PATEL ARTS & LATE SHREE N.P. PATEL COMMERCE COLLEGE

Shree Prahladbhai Kashidas Patel Vidhya Sankul, Naroda, Ahmedabad-382330.

Reaccredited by NAAC with B Grade Third Cycle | Accredited - by 'AAA' = ★★★★★ 4 Star

Phone : 079-22816582, M.: 8866388134 E-mail : shodhsanchay@gmail.com

