VISMAR AQUA

🧠 AI for Aquaculture Behavior Insight

Harnessing Computer Vision to Understand Life Beneath the Surface

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1. Introduction

The future of aquaculture depends not only on feeding fish and shrimp — but on understanding them.
Today, the industry is data-rich in chemistry and mechanics: temperature, oxygen, pH, and flow are measured continuously. Yet one essential source of information remains largely untapped — **behavior**.

Behavior is the first and most sensitive indicator of stress, hunger, health, and reproductive readiness. It reveals what no probe can measure: how animals feel and react.

At **Vismar Aqua**, we believe that integrating **AI-driven behavioral monitoring** into aquaculture will redefine how farmers manage life in water.

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2. The Project Vision

We are developing an **AI-based visual monitoring system** to automatically detect and interpret **breeding behavior of *Litopenaeus vannamei*** — the whiteleg shrimp, one of the world's most farmed crustaceans.

The system uses **computer vision and machine learning** to recognize patterns of courtship, pairing, and spawning in broodstock tanks.
Instead of relying on human observation or indirect parameters, hatchery operators will receive real-time insights into when animals are ready to mate or release eggs.

This project will be implemented at our **new hatchery in Ukraine**, with the goal of validating how digital observation can enhance the efficiency and welfare of shrimp breeding.

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3. Why It Matters

Traditional aquaculture relies on experience and manual observation.
A technician must physically watch tanks to identify behavioral cues — an approach that is time-consuming, subjective, and easily affected by fatigue or bias.

An AI monitoring system changes this reality:

- 📡 **Continuous observation** 24/7, without disturbing animals.
- 🧭 **Early detection of behavioral change**, signaling stress or disease.
- ⏱️ **Precise timing of spawning**, improving hatchery productivity.
- 💧 **Data correlation** between environmental parameters and natural behavior.
- 🌍 **Standardized data** that can be shared, compared, and learned from globally.

In short — AI allows aquaculture to move from reactive management to predictive care.

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4. Broader Applications Across Aquaculture

Although the first application focuses on shrimp reproduction, the technology can be extended to **virtually every aquatic species and farming system**:

🐟 Fish Feeding Behavior

AI can analyze how fish respond to feeding events, reducing waste and optimizing feed conversion — the single largest cost in aquaculture.

🦐 Health and Welfare Monitoring

Changes in swimming speed, posture, or color can indicate stress or disease long before mortality occurs. Continuous video analysis enables early intervention.

🧬 Selective Breeding and Genetics

Behavioral traits can be quantified for selection programs — from growth aggressiveness in tilapia to spawning readiness in shrimp — giving scientists new tools for precision breeding.

🌊 Environmental Adaptation Studies

AI video data can correlate behavioral patterns with environmental variables like temperature, salinity, or photoperiod, supporting research into climate resilience.

🏭 Automation and Workforce Efficiency

Behavioral monitoring can reduce manual workload and improve safety by allowing staff to supervise multiple systems remotely through a single dashboard.

💡 Training and Education

Visualized behavioral analytics become powerful learning material for hatchery managers, students, and technicians, helping raise the professional standard of aquaculture globally.

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5. Socioeconomic and Global Impact

1. **Raising Productivity in Emerging Economies** — affordable AI tools allow small and medium farms to benefit from the same precision as industrial players.

2. **Supporting Animal Welfare and Certification** — transparent, data-driven welfare indicators can support eco-labels and responsible sourcing.

3. **Reducing Losses and Resource Waste** — early detection of stress or disease reduces mortality and chemical use.

4. **Strengthening Food Security** — more efficient reproduction and growth cycles increase local supply of sustainable protein.

5. **Empowering the Next Generation of Farmers** — making aquaculture smarter, cleaner, and data-driven attracts young professionals to the blue economy.

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6. Partnership and Collaboration

This initiative builds upon ongoing collaborations with international research institutions, including the **Alfred Wegener Institute (AWI, Germany)** and experts from the **ShrimpWiz project**, who develop AI solutions for shrimp welfare monitoring.
Together we aim to create a **digital ecosystem** where health, behavior, and environmental data merge into a single intelligent framework.

We are currently inviting partners — from universities, innovation hubs, and technology developers — to join this effort through **research collaboration or co-funded pilots**.

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7. Looking Ahead

This is only the beginning.
The same principles that allow a camera to recognize shrimp behavior today will soon enable complete digital twins of aquaculture systems — where biology and technology coexist seamlessly.

At Vismar Aqua, we see a future where the farmer doesn't just measure water —
they understand the life inside it.

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