SHUYI SUN
SHUSUN@UCDAVIS.EDU

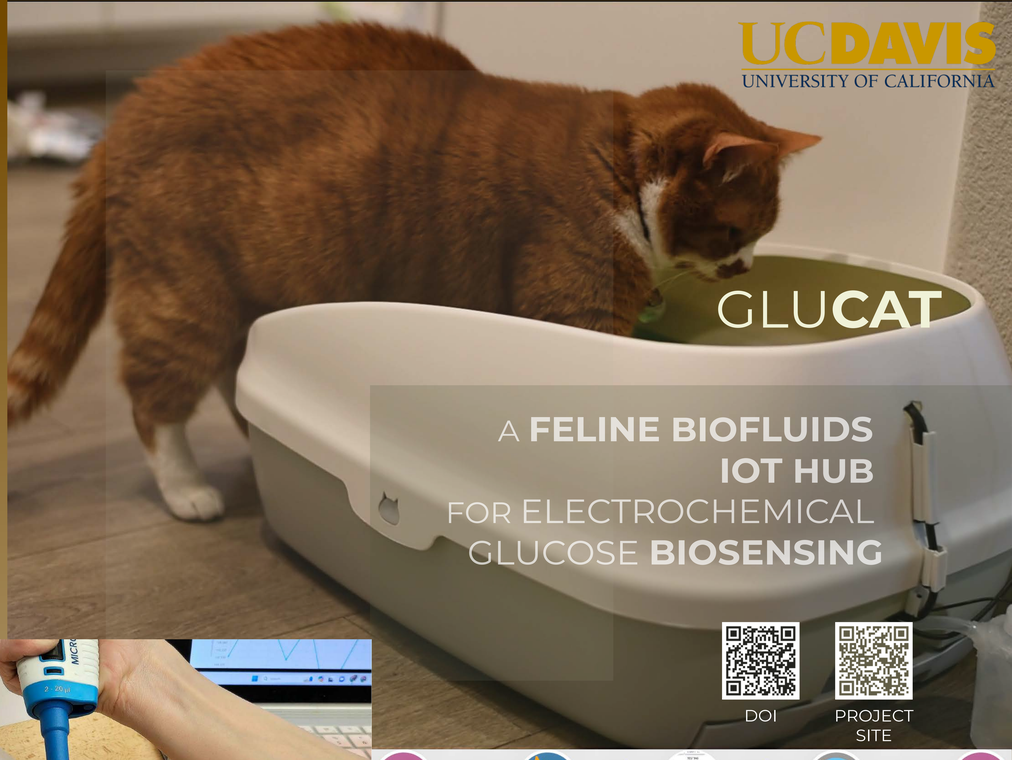
KRYSTLE REAGAN
KREAGAN@UCDAVIS.EDU

ERKIN ŞEKER
ESEKER@UCDAVIS.EDU

KATIA VEGA
KVEGA@UCDAVIS.EDU

Interactive Organisms Lab

UCDAVIS
UNIVERSITY OF CALIFORNIA

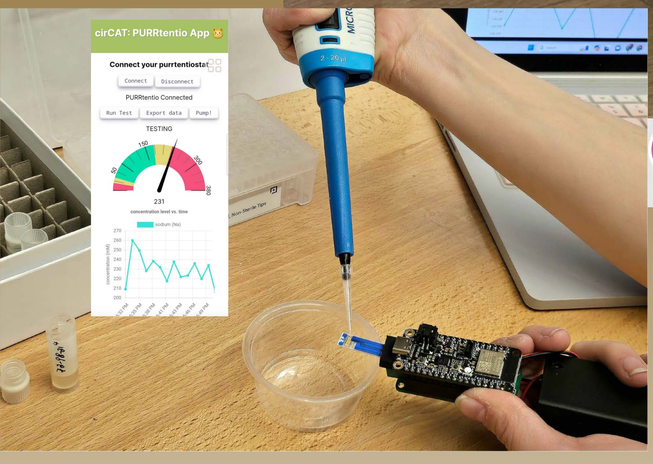


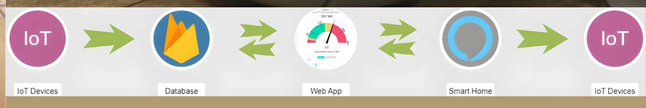
GLUCAT

A **FELINE BIOFLUIDS IOT HUB** FOR ELECTROCHEMICAL GLUCOSE **BIOSENSING**

DOI

PROJECT SITE





Feline urinalysis: valuable insights but invasive, costly, infrequent

GluCAT: facilitates illness monitoring by integrating **electrochemical biosensors** for urine analysis with pet-oriented **IoT** devices, enhancing comprehensive health monitoring for diabetic cat care

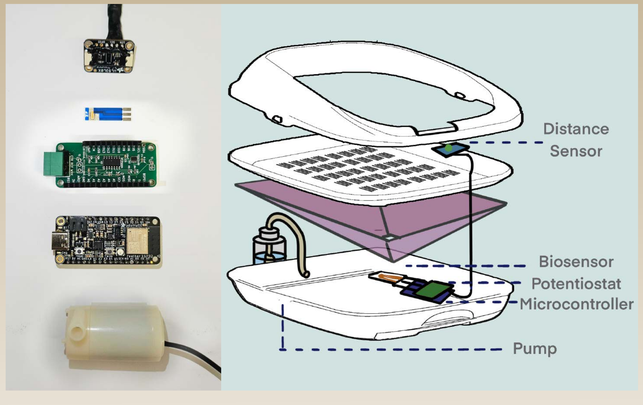
Contributions:

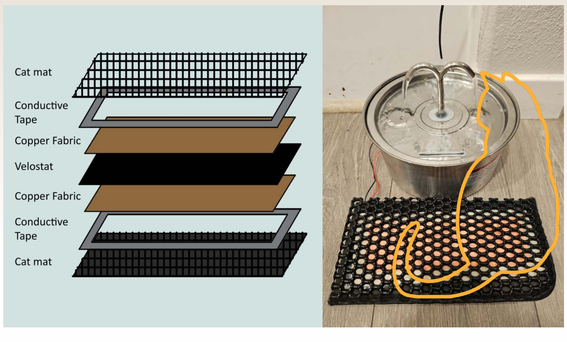
Introduction of **"Feline Biofluids IoT Hub":** electrochemical biosensors with IoT for animal urinalysis

Development of a chronoamperometric system for **continuous monitoring of urine glucose** -- considering suitable constant voltage for each biosensor and interaction time with fluids

Evaluation with lab-tested feline urine samples

In-the-Wild user study to assess real-world usability and effectiveness



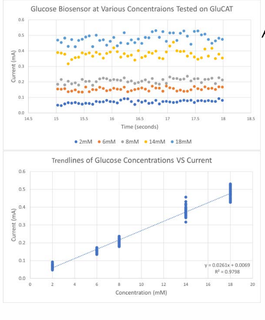


Important for diabetic cats: dynamic between **water intake** and **urine glucose levels**

→ Pressure Sensitive **ACTIVITY MAT** to unobtrusively detect the number of times the cat intakes water

ESP8266 ESP-01 microcontroller sends a timestamp signal to database whenever pressure is sensed to be above a threshold, when a cat is present.

Mat can be used to track other activities beyond water intake.



Chronoamperometry Tests: 5 glucose solutions: 2, 6, 8, 14, 18 mM
At 15 to 18 seconds, each concentration stabilized to an unique amplitude, allowing for identification of corresponding glucose level
higher current = higher concentration

Trendline shows mapping of values of each solution to estimate their concentration based on the current.
Results align with past research using industry grade glucose meters, maintaining a consistent trendline with an r-squared value of 0.98.

Urine Sample Tests: 9 urine samples from diabetic cats
Results align with laboratory results + able to measure lower and higher ranges

Case Study: 50-hour with cat participant that interacted with glucose-sensing litter box and

NEXT:

obtain a holistic understanding of a pet's welfare
enable automatic features to improve quality of life
explore possibilities of incorporating IoT with feline fluid sensing
DIY biosensor fabrication, extensive glucose testing, diabetic cats + owners, exact water intake, etc