Crafting the Ultimate Outdoor Adventure Forecast Using MySQL HeatWave

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Craig Shallahamer is a leader in the fields of machine learning, artificial intelligence and Oracle database performance tuning.

Craig has extensive experience in constructing and teaching predictive modeling methods, notably developing a Reinforcement Machine Learning bot in 1990. He has launched several specialized generative AI conversational assistants, each with distinct personalities and capabilities. As an Applied AI Scientist at Viscosity and the founder of OraPub, Craig is also the author of two acclaimed books: "Oracle Performance Firefighting" and "Forecasting Oracle Performance".

He has received recognition as an Oracle ACE Director for his valuable contributions to the Oracle community through his technical expertise and leadership. Craig is an active participant in Oracle user groups, frequently presenting at conferences and serving as a board member and volunteer.
1990

I created a program where I could play the game tic-tac-toe with a computer, but also enabled the computer to play itself... and learning through that process.
From a more business perspective...

- Internet marketing, focusing on identifying "hot leads" for very specific promotions.
- IT Operations when many Oracle systems must be monitored and Operations possibly alerted; both anomaly detection and performance prediction.
- Domain specific generative Q&A Bots and Conversational Assistants With Personality in multiple business domains. For example, Oracle Performance Tuning, Biblical Texts, Real estate investing platform.
Leveraging **Oracle Cloud Infrastructure**, Al Shane is a *conversational AI* assistant with a vast curated knowledge base of *all things Oracle performance*. Shane also has a very distinct stereotypic *surfer persona*. His objective is to help anyone *improve* their *Oracle system performance* optimization skills.

Al Shane leverages the **Oracle Generative AI** services within **Oracle Cloud Infrastructure** (OCI).

This includes **LLMs, vector** and traditional capabilities within Oracle Databases.

Specifically, Al Shane can use the Oracle Vector Store, Oracle GenAI Services, Oracle Autonomous DB, Oracle MySQL, Oracle MySQL Heatwave and OCI Compute.
Shane

Hey, dude! Not much, just here to help you with any questions or concerns you have about Oracle database performance optimization. Let me know how I can assist you, dude!

Christopher

Hey Shane, What's up?

Shane

Hey, dude! Oracle 23c is still in beta, so the specific features may vary. However, based on the information shared by Oracle, here are some of the top features you can expect in 23c:

- Improved algorithms: Oracle has made enhancements to algorithms, which can improve the performance of data-driven applications.
- JSON handling: There are improvements in JSON handling capabilities, making it easier to work with JSON data in the database.
- Graph analytics: Oracle 23c

Christopher

I need a bullet point list of the top 10 new 23c features.

Shane

I need help Shane. LOTS of people are upset with me because the application performance is so bad. I ran an AWR report. Here’s a brief summary. DB CPU is 90% of DB Time. The wait event, "latch: cache buffer chains" is 80% of all the wait time. And the operating system CPU utilization averages 93%. What type of SQL should I be looking for?

Christopher

Whoa, dude! It sounds like you're dealing with some serious performance issues. Based on the information you provided, it seems like the "latch: cache buffer chains" wait event is causing a major bottleneck in your system. This wait event indicates contention for access to the cache buffer chains latch, which can slow down your application.
Viscosity Pillars and Delivery Models

**DATA**
- Oracle & SQL Server Postgres
- Performance Tuning
- Data Replication
- Data Warehousing Analytics
- Data Integration
- ERP Blue Prints
- Database Upgrades

**APPS**
- APEX
- EBS
- Web/Mobile Apps
- .Net and C#
- E-Business Suite
- SAAS/PAAS

**CLOUD**
- Azure Gold Partner
- Cloud Migrations
- Engineered Systems
- Oracle Cloud Partner
- Google Partner
- AWS Partner Hybrid Cloud

- Workshops
- Assessments
- Proof of Concepts
- Training
- Turnkey Projects
- Managed Services
Viscosity's Oracle ACEs
The Oracle ACE Program

The Oracle ACE Program recognizes and rewards individuals for their contributions to the Oracle community.

Charles Kim  
CEO | Co-Founder  
@racdba  
ACE Director

Rich Niemiec  
Chief Innovation Officer  
@richniemiec  
ACE Director

Craig Shallahamer  
Applied AI Scientist  
@orapub  
ACE Director

Sean Scott  
Principal Consultant  
@oraclesean  
ACE Director

Gary Gordhamer  
Principal Consultant  
@ggordham  
ACE Pro

viscosityna.com  
@ViscosityNA

MySQL and HeatWave Summit
We’ve written over 25 technical books!
READY?
THE PLAN

• Situation – the pain
• Flow
• Architecture
• MySQL & HeatWave calls
• Surprises
The Situation

It's helpful if I know it's going to rain. Most of my hikes are less than six hours. What I need is a six hour rain forecast. Ever hear of a 6hr rain forecast? No. And, local forecast aren't really so local. Perhaps AI can help?
Objective Summary

Build an AI,
to forecast the likelihood of rain,
from now out to six hours into the future.
Needs to run from a URL on my phone.
The WU station ID and API key have been validated to ensure weather data can be retrieved.

http://1234.567:8000/rain-app.py?station=KORNESCO0034&key=9304uriuedsu9
THE ARCHITECTURE
Train using MySQL HeatWave AutoML

```python
# rain_station_data_train_000 must be session specific
training_data_session = f"ml_data.rain_station_data_train{session_rnd_str}" 

sql_mysql(sql=f"drop table if exists {training_data_session}" , session=session, v=v)
sql = f"""
CREATE table {training_data_session} AS
      select  label,
      pressureMax, pressureMax_mva_2, pressureMax_mva_3, 'pressureMax_power_0.5', 'pressureMax_power_2.0',
      precipRate, precipRate_mva_2, precipRate_mva_3, 'precipRate_power_0.5', 'precipRate_power_2.0',
      tempAvg, tempAvg_mva_2, tempAvg_mva_3, 'tempAvg_power_0.5', 'tempAvg_power_2.0'
      from rain_station_data where station_id = '{station_id}'
""

sql_mysql(sql=sql, session=session, v=v)
sql=f"CALL sys.ML_TRAIN('{training_data_session}', 'label',JSON_OBJECT('task', 'classification', 'optimization_metric', 'f1'), @rain_model)"
sql_mysql(sql=sql, session=session, v=v)
result = query_mysql(sql="select @rain_model", engine=engine, v=v)
model_handel = str(result.values[0,0])
logit(f"MAIN: TRAIN COMPLETE: model_handel = {model_handel}")
```

It is really this simple. Create a table with your preprocessed data, set the sys.ML_TRAIN parameters and run sys.ML_TRAIN just like any other MySQL procedure.
First, I need to check if the ML model has already been created. So, I make a simple MySQL query to my `rain_ml_models` table.
To make a prediction using an existing ML model, the most recent data is given to the ML model to make the prediction.

I have lots of preprocessed columns (most_recent_data) so I need to ensure I give the model only the columns (column_names) it wants.
The most recent weather data is placed into the @row_input session variable. @row_input will be given to the trained ML model to help make the prediction.
Before I can request a prediction, the trained ML model must be "loaded" into HeatWave cluster.

Once loaded, the model_handle and the @row_input is given to make the prediction... using a simple SELECT statement!
Predictions using MySQL HeatWave

After the quick prediction occurs, the trained ML model is "unloaded" from the HeatWave cluster.

Then the results are sent to the user's mobile device!
SURPRISES – IT JUST WORKS

• **AutoML** quality, simplicity, HeatWave speed, usability and especially stability.
• **Documentation** is created to help me use the product.
• **Integration (MySQL, HeatWave)** with Python means APIs anywhere, community everywhere and very straightforward.
A special shout-out to both

Kirk Bohn & Preside Foster

Thank you both for helping make this presentation possible!
Now it's your turn!

www.orapub.com for presentation and code.
Thank You!
Christopher

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