AI Developer Productivity Analysis

Executive Summary

This analysis explores how coding hours, cognitive load, sleep, and caffeine intake affect AI developers' productivity and commit performance. The goal was to identify patterns that could help improve efficiency and well-being.

The dataset, originally sourced from Kaggle, was enriched with synthetic data (developer IDs, team assignments, and weekly intervals) for deeper analysis.
An interactive Power BI dashboard with six analytical views highlights relationships between productivity factors.
Findings show that increased AI usage significantly boosts the number of commits, while insufficient sleep and high caffeine intake raise cognitive load, negatively affecting focus and performance. Additionally, higher caffeine consumption was associated with greater AI usage and a higher number of commits, suggesting that developers tend to rely on both AI tools and coffee to maintain productivity during intense coding periods.

Analytical Goals & Business Questions

The objective was to analyze which factors most influence developer productivity and to identify actionable ways to improve performance.

Key business questions:

- How does AI usage influence coding productivity and commits?
- What is the impact of sleep and distractions on cognitive load?
- How does caffeine consumption affect focus and performance?
- How can data-driven insights support a healthier and more efficient workflow?

Dataset & Preparation

The dataset includes 60 developers divided into 3 teams, tracked over 15 weeks.
Key variables: coding hours, AI usage, commits, bugs, sleep, distractions, caffeine intake, and cognitive load.
Data was cleaned and transformed in Power BI. A weekly interval table was added to support time-based analysis and additional fields such as Developer ID and Team were created to enable more detailed and team-level insights.

Dashboard Overview

The dashboard contains six analytical views: **Summary, Coding, Sleep, Bugs, Load,** and **Coffee.**

- **Coding:** Shows a clear positive correlation between AI usage and commit volume. A simulation model predicts that each additional AI hour increases commits by about 1 for Juniors, 1.3 for Mids, and 0.8 for Seniors.
- **Sleep:** Demonstrates that fewer sleep hours correspond to higher distraction levels and cognitive load. Developers with better sleep maintain higher focus and productivity.
- **Bugs:** Highlights that sleep, distractions, and cognitive load directly influence the number of bugs reported.
- **Load:** Confirms that cognitive load rises with lower sleep and higher distractions. On average, cognitive load across all teams remains around level 4.
- **Coffee:** Indicates that caffeine intake grows with coding hours and commits, but excessive consumption increases cognitive strain and lowers self-assessed performance.

Interactive Tooltips

To enhance readability and provide deeper context, several custom tooltips were added to the dashboard. They show dynamic comparisons, explain key metrics, and help users interpret data changes quickly. The bolded names were used in the measures, the names in the parenthesis occur in visualizations.

- **TooltipTextCommitsAIUsage** (Change vs Last Week)– shows week-over-week changes in commits and AI usage with visual indicators (🔼 / 🔽).
- **TooltipSimulation** (Growth vs previous hour)– displays growth in projected commits compared to the previous AI usage hour.
- **TooltipSleepDistraction** (Summary)– summarizes weekly averages of sleep hours and distractions.
- **Tooltip_Coffee_Productivity** (Productivity)– compares current vs previous coding hours, and coffee intake, showing percentage changes and productivity ratio (commits/hour).

Key Insights & Recommendations

Key Insights:

- AI usage strongly increases productivity and commit frequency.
- Reduced sleep and frequent distractions raise cognitive load.
- Higher caffeine intake boosts short-term focus but harms long-term performance.
- Mid-level developers show the best balance between efficiency and workload.

Recommendations:

- Encourage greater use of AI tools through targeted team training.
- Promote healthy work habits and better sleep hygiene.
- Monitor caffeine intake and cognitive load within well-being programs.
- Use dashboard insights for regular workload balancing and performance reviews.

Future Improvements

- Add real or larger datasets for improved accuracy.
- Implement forecasting to predict commit trends.
- Include additional filters (e.g., by project or role).
- Define clear productivity KPIs for easier tracking.
- Explore personalized recommendations based on sleep, AI usage, and workload patterns.