

ANALISIS DISTRIBUSI PERGERAKAN PENUMPANG SISTEM ANGKUTAN MASSAL CEPAT PADA JAM PUNCAK BERDASARKAN DATA AFC (STUDI KASUS JAKARTA SELATAN JAKARTA PUSAT)

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ABSTRAK

Pertumbuhan aktivitas perjalanan di Jakarta mendorong peningkatan penggunaan angkutan massal cepat, sekaligus berpotensi menimbulkan konsentrasi penumpang pada waktu dan stasiun tertentu. Penelitian ini bertujuan menganalisis distribusi penumpang naik (*boarding*) dan turun (*alighting*), pola perjalanan antarstasiun, serta kinerja operasional pada jam puncak pagi dan sore, menggunakan pendekatan kuantitatif deskriptif berbasis data *Automatic Fare Collection* (AFC) pada sembilan lokasi selama 1–30 April 2026. Hari puncak ditentukan dari volume transaksi harian tertinggi, sedangkan jam puncak diidentifikasi melalui interval 15 menit pada hari tersebut, diolah menggunakan Python melalui Google Colaboratory. Hari puncak jatuh pada Kamis, 30 April 2026 sebanyak 55007 perjalanan. Jam puncak pagi terjadi pukul 07.30–07.45 WIB dengan jumlah 1497 penumpang dan jam puncak sore pukul 17.30–17.45 WIB dengan jumlah 2208 penumpang. DKA menjadi titik *boarding* tertinggi pagi hari sekaligus *alighting* tertinggi sore hari, dengan pasangan asal-tujuan tersibuk DKA–IST pada pagi dan BNH–DKA pada sore. Kinerja operasional menunjukkan frekuensi 12 kereta/jam, *headway* 5 menit, serta *load factor* 25,59% pada pagi hari dan 37,74% pada sore hari, serta mengindikasikan kapasitas yang tersedia masih melebihi permintaan pada jam puncak.

Kata kunci: *Automatic Fare Collection*, Jam Puncak, *Boarding*, *Alighting*, Matriks Asal-Tujuan, Faktor Muatan.

ANALYSIS OF PASSENGER MOVEMENT DISTRIBUTION IN A MASS RAPID TRANSIT SYSTEM DURING PEAK HOURS BASED ON AFC DATA (CASE STUDY: SOUTH JAKARTA–CENTRAL JAKARTA)

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ABSTRACT

The growth of travel activity in Jakarta has driven an increase in the use of rapid mass transit, while also potentially causing passenger concentration at certain times and stations. This study aims to analyze the distribution of boarding and alighting passengers, inter-station travel patterns, and operational performance during morning and evening peak hours, using a quantitative descriptive approach based on Automatic Fare Collection (AFC) data from nine locations during 1–30 April 2026. The peak day was determined based on the highest daily transaction volume, while the peak hour was identified through 15-minute intervals on that day, processed using Python via Google Colaboratory. The peak day fell on Thursday, 30 April 2026, with a total of 55,007 trips. The morning peak hour occurred at 07.30–07.45 WIB with 1,497 passengers, and the evening peak hour occurred at 17.30–17.45 WIB with 2,208 passengers. DKA was the station with the highest morning boarding as well as the highest evening alighting, with the busiest origin-destination pair being DKA–IST in the morning and BNH–DKA in the evening. Operational performance showed a frequency of 12 trains/hour, a headway of 5 minutes, and a load factor of 25.59% in the morning and 37.74% in the evening, indicating that the available capacity still exceeds demand during peak hours.

Keywords: *Automatic Fare Collection, peak hour, Boarding, Alighting, Origin–Destination Matrix, , load factor.*