

# **Iterative Definition Refinement for Zero-Shot Classification via LLM-Based Semantic Prototype Optimization**

Supplementary Material

| <b>Iter</b> | <b>Business &amp; Industry</b>  | <b>Cultural &amp; Creative Arts</b>   | <b>Retail eCommerce</b>  |
|-------------|---|---|--|
| 0           | Websites related to professional services, corporate information, industry resources, or B2B operations. They may provide company profiles, product or service offerings, industry news, or tools for business operations, excluding lifestyle services that are primarily recreational.    | Platforms showcasing artistic expression and cultural content, including design, fashion, visual arts, and creative industries. These sites often feature artist portfolios, retail of art and crafts, educational resources, related events, and announcements about new products or services.             | Websites or platforms that sell physical or digital products directly to consumers or businesses online, including lifestyle items and jewelry. These include online stores, marketplaces, and services that facilitate product browsing, purchasing, payment, and delivery, often featuring promotional messages or announcements about new products or services. |
| 65          | Websites focused on B2B transactions, industrial products, technical specifications, and professional services, often including branding, design consultancy, and custom project services for business audiences.   | Websites showcasing artistic works, creative expressions, or cultural projects such as art prints, illustrations, or artistic services, emphasizing community engagement and cultural significance, including artist profiles, galleries, and artistic descriptions without direct commercial transactions. | Websites offering products or services for sale with clear listings, pricing, shopping cart functionality, transactional features, product filtering, promotional offers, and customer account management.   |
| 95          | Websites offering technical services, industrial products, or B2B solutions tailored to industry professionals, emphasizing professional transactions, manufacturing, or infrastructure services. Excludes general consumer products, entertainment content, or personal service offerings. | Websites showcasing original artistic works, creative services, or cultural expressions, emphasizing visual art, body art, or design projects, often with or without direct transactional features, including galleries and archives of artistic creations. Excludes commercial or entertainment content.   | Websites facilitating direct sales of consumer products or services, featuring product listings with pricing, shopping cart functionality, and transactional features. Excludes artisanal or custom product offerings tailored to industry professionals.  |

Table 1. Definition evolution for the three most confused B2MWT-10C classes under M3 (Voyage-4-Nano, Mistral,  $k=5$ ,  $m=1$ ). Initial definitions (iter. 0) share overlapping language around products and services. Refinement progressively introduces distinguishing criteria; B2B focus, exclusion of direct transactions, and explicit transactional features; sharpening inter-class boundaries and improving Macro F1 from 62.65% to 75.49%.