

TuneTrack – Stream API & Functional Interfaces (Advanced)

Professional Question Paper

Scenario Overview

TuneTrack is a music licensing marketplace. The platform applies a dynamic commission on earnings for tracks released before a given year. The commission is tiered based on a base commission percentage, genre-specific adjustment, and age adjustment. The system filters tracks by release year and optional extra filters, computes adjusted earnings, sorts tracks, identifies least-profitable tracks, groups summaries by genre, partitions tracks by rating, and resolves duplicates by merging entries with the same trackId. All operations must use Java's Stream API and functional interfaces.

Requirements

- Store track details in a List.
- Parse user inputs and add tracks, handling invalid formatting.
- Resolve duplicates by trackId (merge earnings, earliest year, max rating, union tags).
- Filter tracks by release year (before a given year) and apply tiered commission (base + genre + age).
- Sort filtered tracks by adjusted earnings, title, and artist.
- Identify and display track(s) with minimum adjusted earnings.
- Display genre-wise summary statistics (count, min, max, sum, average).
- Partition tracks into high-rated and others based on a rating threshold.
- Provide Top-K tracks per genre by adjusted earnings.
- Follow object-oriented specifications and use Java's Stream API & functional interfaces throughout.

Component Specification: Track (POJO Class)

Type: Class

Attributes:

- String trackId
- String artist
- String title
- String genre
- double earnings
- int releaseYear
- double rating
- List tags

Methods: Public getters/setters, no-arg constructor, all-arg constructor, toString(). Note: Class and methods must be public.

Component Specification: TrackUtil

```
public static Track parseTrack(String input)
```

Parses 'trackId:artist:title:genre:earnings:releaseYear:rating[:tag1,tag2,...]' and returns a Track. Throws InvalidTrackException on errors.

```
public static Predicate isReleasedBefore(int year)
```

Returns a predicate to filter tracks released before the given year.

```
public static Function genreAdjustment()
```

Returns a function mapping genre to adjustment: CLASSICAL +1.5, ROCK +0.5, POP +0.0, ELECTRONIC -0.5, INDIE +0.75, default +0.25.

```
public static BiFunction computeAdjustedEarnings(int filterYear)
```

Computes adjusted earnings: $\text{commission\%} = \text{base} + \text{genreAdj} + \text{ageAdj}$; $\text{ageAdj} = 1.0$ if $(\text{filterYear} - \text{releaseYear}) \geq 5$ else 0.0 .
 $\text{Adjusted} = \text{earnings} - (\text{earnings} * \text{commission\%} / 100)$.

```
public static Consumer applyAdjustedEarnings(double adjusted)
```

Returns a Consumer to update track earnings to the adjusted value.

```
public static Comparator byAdjustedEarningsThenTitleThenArtist()
```

Comparator: earnings asc, then title asc, then artist asc.

```
public static BinaryOperator mergeDuplicates()
```

Merge duplicates: earnings sum; releaseYear earliest; rating max; artist/title/genre prefer non-empty or lexicographically smaller; tags union distinct.

Component Specification: TrackManager

```
private List trackList
```

Attribute (private). Getters/setters provided.

```
public void addTrack(Track track)
```

Adds a Track to the list.

```
public void addAllFromStrings(List lines)
```

Parses and adds tracks; invalid lines throw `InvalidTrackException` (handled by UI).

```
public void resolveDuplicatesById()
```

Deduplicate with `Collectors.toMap` and `TrackUtil.mergeDuplicates`.

```
public List getEligibleTracks(int year, double baseCommission, Predicate extraFilter)
```

Filter by year and `extraFilter`; compute adjusted earnings; apply; return eligible list; throw `NoEligibleTrackException` if empty.

```
public List getTracksSortedByAdjustedEarningsTitleArtist()
```

Return all tracks sorted by earnings, then title, then artist.

```
public Stream getMinEarningTracks()
```

Return tracks with the minimum earnings (post-adjustment).

```
public Map getGenreWiseStats()
```

Summarize earnings per genre.

```
public Map< > partitionByRating(double threshold)
```

Partition by rating \geq threshold.

```
public List getTopKByGenre(String genre, int k)
```

Top k by highest earnings for the genre.

Component Specification: Exceptions

`InvalidTrackException` – Public one-arg constructor (message).

`NoEligibleTrackException` – Public one-arg constructor (message).

UserInterface Class – Program Flow

- Prompt for number of tracks.
- Read each track line in the required format.
- Parse with `TrackUtil.parseTrack` and add via `TrackManager.addTrack`; catch `InvalidTrackException` and print error.
- Call `resolveDuplicatesById()` to merge duplicate trackIds.
- Prompt for release year, base commission, rating threshold, and Top-K parameters (genre, k).
- Call `getEligibleTracks(year, baseCommission, extraFilter)` where `extraFilter` can exclude specific genres and enforce min rating.
- Handle `NoEligibleTrackException` and show the message.
- Sort using `getTracksSortedByAdjustedEarningsTitleArtist()`.
- Display: eligible tracks, full sorted list, minimum earning tracks, genre-wise stats, rating partitions, and Top-K per genre.
- Do not use `System.exit(0)`.

Sample Input and Output 1 (Duplicates + Tiered Commission)

Enter the number of tracks

****6****

Enter the details for each track

****T101:Anika Rao:Skyline:INDIE:12000:2014:4.2:live,acoustic****
****T102:Liam Cole:Heartbeat:POP:8500:2018:3.9****
****T103:Chen Wei:Harmonics:CLASSICAL:14000:2012:4.8****
****T102:Liam Cole:Heartbeat (Remix):ELECTRONIC:3000:2018:3.5:remix****
****T104:Sara Noor:Midnight Trails:ROCK:9000:2021:4.3****
****T105:Omar Ali:City Lines:ELECTRONIC:7000:2016:2.7****

Enter the release year to filter tracks released before that year

****2018****

Enter the base commission percentage

****3.0****

Enter the rating threshold

****3.0****

Enter genre for Top-K and the value of K

****ELECTRONIC 2****

Eligible tracks released before 2018 with base 3.0% and tiered adjustments:

trackId=T101 | artist=Anika Rao | title=Skyline | genre=INDIE | earnings=11280.0 | releaseYear=2014 | rating=4.2 | tags=[live, acoustic]
trackId=T103 | artist=Chen Wei | title=Harmonics | genre=CLASSICAL | earnings=12530.0 | releaseYear=2012 | rating=4.8 | tags=[]

All tracks sorted by adjusted earnings, then title, then artist:

trackId=T105 | artist=Omar Ali | title=City Lines | genre=ELECTRONIC | earnings=6655.0 | releaseYear=2016 | rating=2.7 | tags=[]
trackId=T104 | artist=Sara Noor | title=Midnight Trails | genre=ROCK | earnings=9000.0 | releaseYear=2021 | rating=4.3 | tags=[]
trackId=T102 | artist=Liam Cole | title=Heartbeat | genre=ELECTRONIC | earnings=11375.0 | releaseYear=2018 | rating=3.9 | tags=[remix]
trackId=T101 | artist=Anika Rao | title=Skyline | genre=INDIE | earnings=11280.0 | releaseYear=2014 | rating=4.2 | tags=[live, acoustic]
trackId=T103 | artist=Chen Wei | title=Harmonics | genre=CLASSICAL | earnings=12530.0 | releaseYear=2012 | rating=4.8 | tags=[]

Tracks with the Minimum Earnings:

trackId=T105 | artist=Omar Ali | title=City Lines | genre=ELECTRONIC | earnings=6655.0 | releaseYear=2016 | rating=2.7 | tags=[]

Genre-wise Summary (earnings after commission):

CLASSICAL → count=1 | min=12530.0 | max=12530.0 | sum=12530.0 | avg=12530.0
ELECTRONIC → count=2 | min=6655.0 | max=11375.0 | sum=18030.0 | avg=9015.0
INDIE → count=1 | min=11280.0 | max=11280.0 | sum=11280.0 | avg=11280.0
ROCK → count=1 | min=9000.0 | max=9000.0 | sum=9000.0 | avg=9000.0

Partition by rating (threshold=3.0):

High-rated (>=3.0): [T101, T102, T103, T104]
Others (<3.0): [T105]

Top-2 in ELECTRONIC by earnings:

trackId=T102 | artist=Liam Cole | title=Heartbeat | genre=ELECTRONIC | earnings=11375.0 | releaseYear=2018 | rating=3.9 | tags=[remix]
trackId=T105 | artist=Omar Ali | title=City Lines | genre=ELECTRONIC | earnings=6655.0 | releaseYear=2016 | rating=2.7 | tags=[]

Sample Input and Output 2 (Invalid Lines + No Eligible)

Enter the number of tracks

****4****

Enter the details for each track

****TX01:Ava Lee:Ocean Echo:POP:6800:2022:4.0****

****BADLINE****

****TX02:Ken Ito:Paper Beats:CLASSICAL:9000:2020:4.7****

****TX03:Mia Park:Night Drive:ELECTRONIC:7500:2021:3.5:live****

Enter the release year to filter tracks released before that year

****2019****

Enter the base commission percentage

****5.0****

Enter the rating threshold

****4.0****

Enter genre for Top-K and the value of K

****POP 1****

InvalidTrackException: Input 'BADLINE' is not in the required format.

No tracks released before 2019 to apply commission

All tracks sorted by adjusted earnings, then title, then artist:

trackId=TX01 | artist=Ava Lee | title=Ocean Echo | genre=POP | earnings=6800.0 | releaseYear=2022 | rating=4.0 | tags=[]
trackId=TX03 | artist=Mia Park | title=Night Drive | genre=ELECTRONIC | earnings=7462.5 | releaseYear=2021 | rating=3.5 | tags=[live]
trackId=TX02 | artist=Ken Ito | title=Paper Beats | genre=CLASSICAL | earnings=9000.0 | releaseYear=2020 | rating=4.7 | tags=[]

Tracks with the Minimum Earnings:

trackId=TX01 | artist=Ava Lee | title=Ocean Echo | genre=POP | earnings=6800.0 | releaseYear=2022 | rating=4.0 | tags=[]

Genre-wise Summary (earnings after commission):

CLASSICAL → count=1 | min=9000.0 | max=9000.0 | sum=9000.0 | avg=9000.0
ELECTRONIC → count=1 | min=7462.5 | max=7462.5 | sum=7462.5 | avg=7462.5
POP → count=1 | min=6800.0 | max=6800.0 | sum=6800.0 | avg=6800.0

Partition by rating (threshold=4.0):

High-rated (≥ 4.0): [TX01, TX02]

Others (< 4.0): [TX03]

Top-1 in POP by earnings:

trackId=TX01 | artist=Ava Lee | title=Ocean Echo | genre=POP | earnings=6800.0 | releaseYear=2022 | rating=4.0 | tags=[]

Sample Input and Output 3 (Tie for Minimum + Age Adjustment)

Enter the number of tracks

****5****

Enter the details for each track

****R201:Eva Chen:Autumn Leaf:CLASSICAL:10000:2010:4.9****

****R202:Nate Kim:Street Pulse:ROCK:6000:2017:3.8****

****R203:Noah Singh:Glass Waves:INDIE:6000:2013:4.0****

****R204:Isha Verma:Silver Lines:POP:6000:2020:4.2****

****R205:Zara Ali:Low Tide:ELECTRONIC:6200:2016:3.1****

Enter the release year to filter tracks released before that year

****2018****

Enter the base commission percentage

****2.0****

Enter the rating threshold

****3.5****

Enter genre for Top-K and the value of K

****ROCK 2****

Eligible tracks released before 2018 with base 2.0% and tiered adjustments:

trackId=R201 | artist=Eva Chen | title=Autumn Leaf | genre=CLASSICAL | earnings=9250.0 | releaseYear=2010 | rating=4.9 | tags=[]

trackId=R202 | artist=Nate Kim | title=Street Pulse | genre=ROCK | earnings=5670.0 | releaseYear=2017 | rating=3.8 | tags=[]

trackId=R203 | artist=Noah Singh | title=Glass Waves | genre=INDIE | earnings=5670.0 | releaseYear=2013 | rating=4.0 | tags=[]

All tracks sorted by adjusted earnings, then title, then artist:

trackId=R202 | artist=Nate Kim | title=Street Pulse | genre=ROCK | earnings=5670.0 | releaseYear=2017 | rating=3.8 | tags=[]

trackId=R203 | artist=Noah Singh | title=Glass Waves | genre=INDIE | earnings=5670.0 | releaseYear=2013 | rating=4.0 | tags=[]

trackId=R204 | artist=Isha Verma | title=Silver Lines | genre=POP | earnings=6000.0 | releaseYear=2020 | rating=4.2 | tags=[]

trackId=R205 | artist=Zara Ali | title=Low Tide | genre=ELECTRONIC | earnings=6070.0 | releaseYear=2016 | rating=3.1 | tags=[]

trackId=R201 | artist=Eva Chen | title=Autumn Leaf | genre=CLASSICAL | earnings=9250.0 | releaseYear=2010 | rating=4.9 | tags=[]

Tracks with the Minimum Earnings:

trackId=R202 | artist=Nate Kim | title=Street Pulse | genre=ROCK | earnings=5670.0 | releaseYear=2017 | rating=3.8 | tags=[]

trackId=R203 | artist=Noah Singh | title=Glass Waves | genre=INDIE | earnings=5670.0 | releaseYear=2013 | rating=4.0 | tags=[]