```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8" />
  <meta name="viewport" content="width=device-width,initial-scale=1" />
  <title>X-Ray Project — Overview</title>
  <meta name="description" content="A concise professional one-page website describing an X-ray project: background, methods, applications, safety and contact." />

  <style>
    :root{
      --bg: #f6f7fb;
      --card: #ffffff;
      --muted: #6b7280;
      --accent: #0f4c81;
      --accent-2: #1f78b4;
      --glass: rgba(15,76,129,0.06);
      --radius: 12px;
      --max-width: 1000px;
      --gap: 20px;
      --shadow: 0 6px 18px rgba(11,20,40,0.06);
      --mono: ui-monospace, SFMono-Regular, Menlo, Monaco, "Roboto Mono", "Segoe UI Mono", monospace;
      --sans: Inter, system-ui, -apple-system, "Segoe UI", Roboto, "Helvetica Neue", Arial;
    }

    html,body{
      height:100%;
      margin:0;
      font-family: var(--sans);
      background: linear-gradient(180deg,var(--bg),#eef2fb 60%);
      color:#0b1220;
      -webkit-font-smoothing:antialiased;
      -moz-osx-font-smoothing:grayscale;
      line-height:1.45;
      font-size:16px;
    }

    .container{
      max-width: var(--max-width);
      margin: 40px auto;
      padding: 24px;
    }

    header.site-head{
      display:flex;
      align-items:center;
      justify-content:space-between;
```

```
  gap:16px;
  margin-bottom:18px;
}

.brand{
  display:flex;
  align-items:center;
  gap:12px;
  text-decoration:none;
  color:inherit;
}

.logo {
  width:56px;
  height:56px;
  border-radius:10px;
  display:grid;
  place-items:center;
  background: linear-gradient(135deg,var(--accent),var(--accent-2));
  box-shadow: var(--shadow);
  color:white;
  font-weight:700;
  font-family: var(--mono);
  font-size:18px;
}

nav.top-nav{
  display:flex;
  gap:14px;
  align-items:center;
}

nav.top-nav a{
  text-decoration:none;
  color:var(--muted);
  font-weight:600;
  padding:8px 12px;
  border-radius:8px;
}
nav.top-nav a:hover{ color:var(--accent); background:transparent; }

main.card{
  background:var(--card);
  border-radius: var(--radius);
  padding:28px;
  box-shadow: var(--shadow);
}
```

```
.hero{
  display:grid;
  grid-template-columns: 1fr;
  gap:20px;
  align-items:center;
  margin-bottom:18px;
}

.hero h1{
  margin:0 0 6px 0;
  font-size:28px;
  letter-spacing:-0.4px;
  color: #071133;
}

.hero p.lead{
  margin:0;
  color:var(--muted);
  font-size:15px;
}

.cta-row{
  display:flex;
  gap:10px;
  margin-top:12px;
  flex-wrap:wrap;
}

.btn{
  display:inline-flex;
  align-items:center;
  gap:8px;
  text-decoration:none;
  padding:10px 14px;
  border-radius:10px;
  font-weight:600;
}
.btn.primary{
  background: linear-gradient(90deg,var(--accent),var(--accent-2));
  color:white;
  box-shadow: 0 6px 16px rgba(32,100,160,0.12);
}
.btn.ghost{
  background:transparent;
  color:var(--accent);
  border:1px solid rgba(15,76,129,0.08);
}
```

```
.grid-2{
  display:grid;
  grid-template-columns: 1fr;
  gap: var(--gap);
}

section{
  padding:18px 0;
  border-top:1px dashed rgba(11,20,40,0.04);
}

.card-sm {
  background: var(--glass);
  padding:16px;
  border-radius:10px;
}

.meta{
  display:flex;
  gap:12px;
  flex-wrap:wrap;
  color:var(--muted);
  font-size:14px;
  margin-top:8px;
}

.kpi{
  display:flex;
  gap:12px;
  align-items:center;
  background:linear-gradient(180deg,rgba(255,255,255,0.6), rgba(255,255,255,0.5));
  padding:12px;
  border-radius:10px;
  min-width:120px;
  box-shadow: 0 4px 10px rgba(11,20,40,0.03);
}
.kpi strong{ font-size:18px; display:block; color:var(--accent); }

.methods{
  display:flex;
  flex-direction:column;
  gap:12px;
}

.method-item{
  display:flex;
  gap:12px;
  align-items:flex-start;
```

```
}
.method-item .dot{
  width:10px;height:10px;border-radius:50%;margin-top:6px;background:var(--accent);
  flex:0 0 10px;
}

.apps{
  display:flex;
  gap:12px;
  flex-wrap:wrap;
  margin-top:8px;
}
.app{
  flex: 1 1 200px;
  min-width:150px;
  background:linear-gradient(180deg, #fff, rgba(255,255,255,0.98));
  padding:14px;
  border-radius:10px;
  box-shadow: var(--shadow);
}

.gallery{
  display:grid;
  grid-template-columns: repeat(3,1fr);
  gap:10px;
  margin-top:12px;
  align-items:start;
}
.gallery .img{
  aspect-ratio: 4/3;
  border-radius:8px;
  background: linear-gradient(180deg, rgba(15,76,129,0.06), rgba(31,120,180,0.03));
  display:flex;
  align-items:center;
  justify-content:center;
  color:var(--muted);
  font-size:13px;
  box-shadow: 0 6px 14px rgba(11,20,40,0.04);
}

.diagram-wrap{
  display:flex;
  justify-content:center;
  align-items:center;
  padding:12px;
  background:linear-gradient(180deg, rgba(255,255,255,0.98), rgba(245,247,250,0.98));
  border-radius:8px;
  box-shadow: 0 6px 14px rgba(11,20,40,0.04);
```

```
    }

    .caption{ color:var(--muted); font-size:14px; text-align:center; margin-top:8px; }

    footer{
      margin-top:20px;
      display:flex;
      justify-content:space-between;
      align-items:center;
      gap:12px;
      flex-wrap:wrap;
      color:var(--muted);
      font-size:14px;
    }

    @media(min-width:800px){
      .hero{ grid-template-columns: 1fr 340px; }
      .grid-2{ grid-template-columns: 1fr 360px; }
      .gallery{ grid-template-columns: repeat(3,1fr); }
    }

    @media(max-width:420px){
      .logo{ width:48px; height:48px; font-size:16px; }
      .hero h1{ font-size:22px; }
      .container{ padding:16px; margin:18px auto; }
      .gallery{ grid-template-columns: 1fr; }
    }

    a:focus, button:focus {
      outline: 3px solid rgba(31,120,180,0.18);
      outline-offset: 2px;
    }

    @media print{
      body{ background:white; color:black; }
      header, .cta-row, footer { display:none; }
      .container{ max-width:100%; padding:0; margin:0; }
    }
  </style>
</head>
<body>
  <div class="container" role="document">
    <header class="site-head" role="banner">
      <a class="brand" href="#" aria-label="X-Ray Project Home">
        <div class="logo" aria-hidden="true">XR</div>
        <div>
          <div style="font-weight:700">X-Ray Project</div>
          <div style="font-size:12px;color:var(--muted)">Physics · Imaging · Safety</div>
```

```
      </div>
    </a>

    <nav class="top-nav" role="navigation" aria-label="Primary">
      <a href="#about">About</a>
      <a href="#methods">Methods</a>
      <a href="#applications">Applications</a>
      <a href="#safety">Safety</a>
      <a href="#contact">Contact</a>
    </nav>
  </header>

  <main class="card" role="main" aria-labelledby="page-title">
    <section class="hero" aria-labelledby="page-title">
      <div>
        <h1 id="page-title">Project: X-ray Imaging & Analysis</h1>
        <p class="lead">A concise project summary exploring the physics of X-rays, imaging techniques, practical applications, safety considerations, and experimental results. Designed for presentations, reports, or portfolio display.</p>

        <div class="meta" aria-hidden="true">
          <div class="kpi"><div><small>Duration</small><strong>6 weeks</strong></div></div>
          <div class="kpi"><div><small>Team</small><strong>3 members</strong></div></div>
          <div class="kpi"><div><small>Tools</small><strong>Digital radiography, Python</strong></div></div>
        </div>

        <div class="cta-row" style="margin-top:14px;">
          <a class="btn primary" href="#methods">View methods</a>
          <a class="btn ghost" href="#contact">Download report</a>
        </div>
      </div>

      <aside class="card-sm" aria-label="Quick summary">
        <h3 style="margin:0 0 8px 0;">Quick summary</h3>
        <p style="margin:0;color:var(--muted);font-size:14px;">
          This project investigates X-ray generation, detector types, image acquisition parameters (kVp, mA, exposure time), and post-processing techniques to improve contrast and reduce noise. Results quantify spatial resolution and dose tradeoffs.
        </p>
      </aside>
    </section>

    <section id="about" aria-labelledby="about-heading">
      <div class="grid-2">
        <div>
```

```
          <h2 id="about-heading">About X-Rays</h2>
          <p>
            X-rays are high-energy electromagnetic radiation used for imaging and diagnostics. They were discovered by Wilhelm Röntgen in 1895 and are widely used in medicine, industry, and research for non-destructive inspection.
          </p>

          <h3 style="margin-top:14px;">Project goals</h3>
          <ul>
            <li>Characterize image quality vs. exposure (kVp/mAs).</li>
            <li>Compare detector performance (CR, DR, film).</li>
            <li>Explore noise reduction and edge enhancement algorithms.</li>
            <li>Evaluate dose optimization strategies.</li>
          </ul>
        </div>

        <div>
          <h3>Key deliverables</h3>
          <ul style="color:var(--muted);font-size:15px">
            <li>Report with methodology & results</li>
            <li>Sample image gallery with annotations</li>
            <li>Scripts for basic image processing (Python)</li>
            <li>Safety & compliance checklist</li>
          </ul>
          <div style="margin-top:12px;">
            <strong>Keywords:</strong>
            <div style="margin-top:8px; display:flex; gap:8px; flex-wrap:wrap;">
              <span class="kpi" style="min-width:initial;padding:8px 10px;">Radiography</span>
              <span class="kpi" style="min-width:initial;padding:8px 10px;">Image quality</span>
              <span class="kpi" style="min-width:initial;padding:8px 10px;">Dose</span>
            </div>
          </div>
        </div>
      </div>
    </section>

    <section id="methods" aria-labelledby="methods-heading">
      <h2 id="methods-heading">Methods</h2>
      <div class="methods" role="list">
        <div class="method-item" role="listitem">
          <div class="dot" aria-hidden="true"></div>
          <div>
            <strong>X-ray generation</strong>
            <div style="color:var(--muted);margin-top:4px;">Tube voltage (kVp) and tube current (mA) were varied to study contrast and penetration. Filtration and focal spot size documented.</div>
```

```
          </div>
        </div>

        <div class="method-item" role="listitem">
          <div class="dot" aria-hidden="true"></div>
          <div>
            <strong>Detectors & acquisition</strong>
            <div style="color:var(--muted);margin-top:4px;">Comparisons between computed radiography (CR) and direct digital radiography (DR) using standard phantoms for spatial resolution and contrast-detail analysis.</div>
          </div>
        </div>

        <div class="method-item" role="listitem">
          <div class="dot" aria-hidden="true"></div>
          <div>
            <strong>Analysis & processing</strong>
            <div style="color:var(--muted);margin-top:4px;">Image processing with open-source tools (equalization, denoising filters, edge detectors). Quantitative metrics: SNR, CNR, MTF estimation.</div>
          </div>
        </div>
      </div>
    </section>

    <section id="applications" aria-labelledby="apps-heading">
      <h2 id="apps-heading">Applications</h2>

      <div class="apps" role="list">
        <div class="app" role="article" aria-labelledby="app-med">
          <h4 id="app-med">Medical imaging</h4>
          <p style="color:var(--muted);margin:6px 0 0 0;">Chest, skeletal exams, dental radiography, and trauma screening remain core clinical uses.</p>
        </div>

        <div class="app" role="article" aria-labelledby="app-ind">
          <h4 id="app-ind">Industrial & security</h4>
          <p style="color:var(--muted);margin:6px 0 0 0;">Non-destructive testing of welds, castings, and baggage screening at airports.</p>
        </div>

        <div class="app" role="article" aria-labelledby="app-research">
          <h4 id="app-research">Research</h4>
          <p style="color:var(--muted);margin:6px 0 0 0;">Material science studies, small-animal imaging and novel detector development.</p>
        </div>
      </div>
```

```
      <h3 style="margin-top:16px">Schematic: muscle vs bone (cylinder)</h3>

      <div class="gallery" role="list" aria-label="Sample images and diagrams">
        <!-- Cylinder diagram replaces one gallery item; other two remain sample placeholders
-->
        <figure class="diagram-wrap" role="group" aria-labelledby="cyl-title" tabindex="0">
          <svg id="muscle-bone-cyl" width="100%" height="260" viewBox="0 0 600 260"
role="img" aria-labelledby="cyl-title cyl-desc">
            <title id="cyl-title">Cross-section and side view of a muscle and bone
cylinder</title>
            <desc id="cyl-desc">Vector diagram showing an outer muscle cylinder (red/pink)
and inner bone cylinder (ivory), with top ellipse, side body, and bottom ellipse to illustrate 3D
cylinder geometry. Labels indicate 'Muscle' and 'Bone'.</desc>

            <!-- define gradients -->
            <defs>
              <linearGradient id="muscleGrad" x1="0" x2="0" y1="0" y2="1">
                <stop offset="0" stop-color="#ffd0d0"/>
                <stop offset="1" stop-color="#f7b1b1"/>
              </linearGradient>

              <linearGradient id="boneGrad" x1="0" x2="0" y1="0" y2="1">
                <stop offset="0" stop-color="#fffef5"/>
                <stop offset="1" stop-color="#efe8d2"/>
              </linearGradient>

              <filter id="softShadow" x="-50%" y="-50%" width="200%" height="200%">
                <feDropShadow dx="0" dy="6" stdDeviation="10" flood-color="#000"
flood-opacity="0.12"/>
              </filter>
            </defs>

            <!-- positions -->
            <!-- left: cross-section circles -->
            <g transform="translate(120,120)">
              <!-- muscle cross-section -->
              <circle cx="0" cy="0" r="60" fill="url(#muscleGrad)" stroke="#d89" stroke-width="2"
/>
              <!-- bone cross-section -->
              <circle cx="0" cy="0" r="26" fill="url(#boneGrad)" stroke="#d3caa8"
stroke-width="1.5" />
              <!-- labels -->
              <text x="0" y="-78" font-family="Arial, Helvetica, sans-serif" font-size="14"
fill="#071133" text-anchor="middle">Cross-section</text>
              <text x="0" y="95" font-family="Arial, Helvetica, sans-serif" font-size="13"
fill="#6b7280" text-anchor="middle">Outer: Muscle — Inner: Bone</text>
            </g>
```

```
            <!-- right: side view cylinder -->
            <g transform="translate(330,40)">
              <!-- top ellipse (muscle outer) -->
              <ellipse cx="120" cy="28" rx="95" ry="26" fill="url(#muscleGrad)" stroke="#d89"
stroke-width="2" />
              <!-- side rectangle for muscle body -->
              <rect x="25" y="28" width="190" height="150" fill="url(#muscleGrad)"
stroke="none"/>
              <!-- bottom ellipse for outer (slightly darker, behind) -->
              <ellipse cx="120" cy="178" rx="95" ry="26" fill="#e6a6a6" opacity="0.25" />

              <!-- bone top ellipse -->
              <ellipse cx="120" cy="38" rx="42" ry="12" fill="url(#boneGrad)" stroke="#d3caa8"
stroke-width="1.2" />
              <!-- bone rectangular body -->
              <rect x="90" y="38" width="60" height="110" fill="url(#boneGrad)" />
              <!-- bone bottom ellipse -->
              <ellipse cx="120" cy="148" rx="42" ry="12" fill="#dcd2b5" opacity="0.9" />

              <!-- soft shading / shadow -->
              <g filter="url(#softShadow)">
                <ellipse cx="120" cy="180" rx="110" ry="24" fill="#000" opacity="0.06" />
              </g>

              <!-- labels with leader lines -->
              <line x1="225" y1="50" x2="270" y2="50" stroke="#9aa7b6" stroke-width="1" />
              <text x="278" y="54" font-family="Arial, Helvetica, sans-serif" font-size="13"
fill="#071133">Muscle (outer)</text>

              <line x1="150" y1="90" x2="210" y2="110" stroke="#9aa7b6" stroke-width="1" />
              <text x="214" y="114" font-family="Arial, Helvetica, sans-serif" font-size="13"
fill="#071133">Bone (inner)</text>

              <!-- small legend box -->
              <rect x="12" y="6" width="120" height="48" rx="6" fill="#fff" stroke="#e9eef6" />
              <text x="20" y="26" font-family="Arial, Helvetica, sans-serif" font-size="12"
fill="#6b7280">Schematic</text>
              <text x="20" y="40" font-family="Arial, Helvetica, sans-serif" font-size="11"
fill="#9aa7b6">Muscle vs Bone cylinder</text>
            </g>
          </svg>

          <figcaption class="caption" id="cyl-caption">
            Diagram: outer muscle cylinder (pink) surrounding an inner bone cylinder (ivory).
Use this schematic to illustrate tissue contrast for X-ray imaging.
          </figcaption>
        </figure>
```

```
        <div class="img" role="img" aria-label="Bony detail sample">Bone detail</div>
        <div class="img" role="img" aria-label="Industrial radiograph sample">Industrial</div>
      </div>
    </section>

    <section id="safety" aria-labelledby="safety-heading">
      <h2 id="safety-heading">Safety & compliance</h2>
      <p style="margin-top:0;color:var(--muted);">Radiation protection is essential. Follow ALARA principles, use shielding, monitor dose, and ensure trained operators. Regulatory requirements differ by country — consult local radiation safety authority for legal limits and recordkeeping.</p>

      <h3 style="margin-top:12px">Key safety measures</h3>
      <ul style="color:var(--muted);">
        <li>Use lead aprons and thyroid shields where appropriate.</li>
        <li>Limit exposure time and maximize distance from source.</li>
        <li>Calibrate equipment regularly and log exposures.</li>
        <li>Provide staff training and signage in controlled areas.</li>
      </ul>
    </section>

    <section id="results" aria-labelledby="results-heading">
      <h2 id="results-heading">Selected results (example)</h2>
      <p style="color:var(--muted);margin-top:6px;">Representative findings: increasing kVp improved penetration but reduced contrast for soft tissues; DR detectors provided better SNR at lower dose compared to CR for the tested phantom.</p>

      <div style="display:flex;gap:12px;flex-wrap:wrap;margin-top:12px;">
        <div class="kpi" style="min-width:180px;">
          <div><small>Spatial resolution</small><strong>> 2.0 lp/mm</strong></div>
        </div>
        <div class="kpi" style="min-width:180px;">
          <div><small>SNR improvement</small><strong>~1.6× (DR vs CR)</strong></div>
        </div>
        <div class="kpi" style="min-width:180px;">
          <div><small>Typical dose</small><strong>0.05–0.15 mSv (chest)</strong></div>
        </div>
      </div>
    </section>

    <section id="contact" aria-labelledby="contact-heading">
      <h2 id="contact-heading">Contact & resources</h2>
      <p style="color:var(--muted);margin-top:6px;">Want the full report, dataset, or the image processing scripts? Contact the project lead below.</p>

      <div style="display:flex;gap:18px;flex-wrap:wrap;margin-top:12px;">
        <div style="min-width:220px;">
          <strong>Project lead</strong>
```

```
          <div style="color:var(--muted);margin-top:6px;">Nureen Jaz (placeholder)</div>
          <div style="color:var(--muted);margin-top:6px;">Email: <a
href="mailto:youremail@example.com">youremail@example.com</a></div>
        </div>

        <div style="min-width:260px;">
          <strong>Resources</strong>
          <ul style="color:var(--muted);margin-top:6px;">
            <li>Sample report (PDF)</li>
            <li>Processing scripts (Python)</li>
            <li>Phantom images & raw data</li>
          </ul>
          <div style="margin-top:8px;">
            <a class="btn ghost" href="#" role="button">Request files</a>
          </div>
        </div>
      </div>
    </section>

    <footer role="contentinfo">
      <div>© <span id="year"></span> X-Ray Project • All rights reserved</div>
      <div style="color:var(--muted);">Designed for academic & demo use</div>
    </footer>
  </main>
 </div>

 <script>
  document.getElementById('year').textContent = new Date().getFullYear();

  (function(){
    const links = document.querySelectorAll('a[href^="#"]');
    for(const a of links){
      a.addEventListener('click', function(e){
        const target = document.querySelector(this.getAttribute('href'));
        if(target){
          e.preventDefault();
          target.scrollIntoView({behavior:'smooth', block:'start'});
          target.setAttribute('tabindex','-1');
          target.focus({preventScroll:true});
        }
      });
    }
  })();
 </script>
</body>
</html>
```